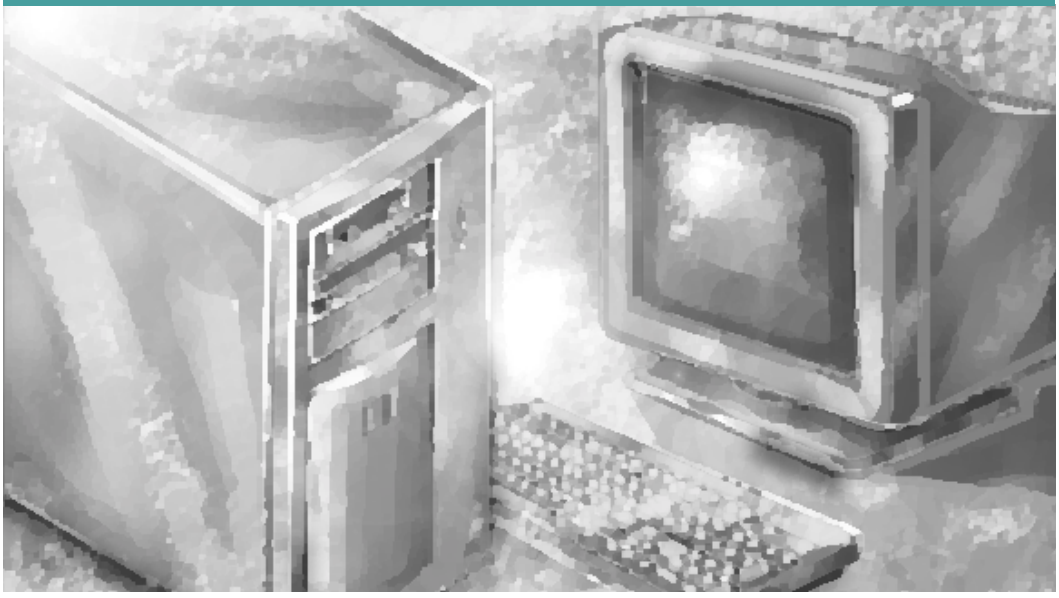
Dell® PowerEdge® 2100/180 and 2100/200 Systems

SERVICE MANUAL



Model MMM

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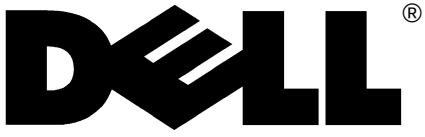

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September 1996 P/N 82502

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Read This First

A prerequisite for using this manual to service Dell computer systems is a basic knowledge of IBM®-compatible PCs and prior training in IBM-compatible PC troubleshooting techniques. In addition to information provided in this manual and the *User's Guide* that came with the system, Dell provides the *Diagnostics and Troubleshooting Guide* for troubleshooting procedures and instructions on using the Dell diagnostics to test the computer system.

Warnings, Cautions, and Notes

Throughout this manual, there may be blocks of text printed in bold type or in italic type. These blocks are warnings, cautions, and notes, and they are used as follows:

WARNING: A WARNING indicates the potential for bodily harm and provides instructions for how to avoid the problem.

CAUTION: A CAUTION indicates either potential damage to hardware or loss of data and provides instructions for how to avoid the problem.

NOTE: A NOTE provides helpful information about using the computer system.

Chapter 1
System Overview

The Dell® PowerEdge® 2100/180 and 2100/200 systems, covered in this manual are high-speed, upgradable, server systems, which use the Intel® Pentium® Pro family of microprocessors. PowerEdge 2100 systems incorporate the high-performance peripheral component interconnect (PCI) local bus as well as the extended industry-standard architecture (EISA) expansion bus. These buses are built into the system board, which also integrates a Pentium Pro microprocessor and all other elements of the basic computer system.

The microprocessor module is installed in a zero insertion force (ZIF) socket on the system board. This allows upgrading of the system board to a faster, more powerful microprocessor when one becomes available. Contact Dell for information about Dell-supported microprocessor upgrades.

The Pentium Pro microprocessor contains a built-in clock multiplier circuit, which increases the internal operating frequency to a multiple of the system clock frequency. The microprocessors for each of these systems and their operating frequencies are as follows:

- Dell PowerEdge 2100/180 system — 180 MHz derived from a system clock frequency of 60 MHz
- Dell PowerEdge 2100/200 system — 200 MHz derived from a system clock frequency of 66 MHz

System Features

In addition to the standard features found in a traditional personal computer, Dell PowerEdge 2100 systems include the following new and/or advanced features:

- 256 KB of cache memory internal to the Pentium Pro module
- 16 MB of 72-bit wide, buffered, extended-data output (EDO)-type main memory, upgradable to 256 MB
- Memory error correction code (ECC) feature is built into the memory controller on the system board
- Advanced combination EISA and PCI expansion subsystem
- Three EISA and three PCI expansion-card slots (none of the expansion-card slots are shared)
- Integrated VGA-compatible video subsystem attached to the PCI bus with 1 MB video memory standard
- BIOS in upgradable flash memory attached to the EISA bus
- Integrated super I/O controller attached to the EISA bus, provides a bidirectional parallel port, two serial ports, and the diskette drive interface
- Integrated ultra (fast-20) wide small computer system interface (SCSI) controller
- Integrated server management circuitry that monitors operation of the system cooling fan for running or not, as well as critical system voltages and temperatures
- 3.5-inch diskette drive and a CD-ROM drive standard in externally accessible drive bays
- Recessed power and reset buttons to prevent accidental system interruptions
- New quick-test feature in the diskette-based diagnostics (for more information about **QUICK TEST**, see "Running the Diskette-Based Diagnostics" in Chapter 2.)

All of these features, except the new quick-test feature, are briefly described in this chapter. For a complete list of system features, see "Technical Specifications" found later in this chapter.

When following the text in this manual, assume that the location or direction relative to the computer is as shown in Figure 1-1.

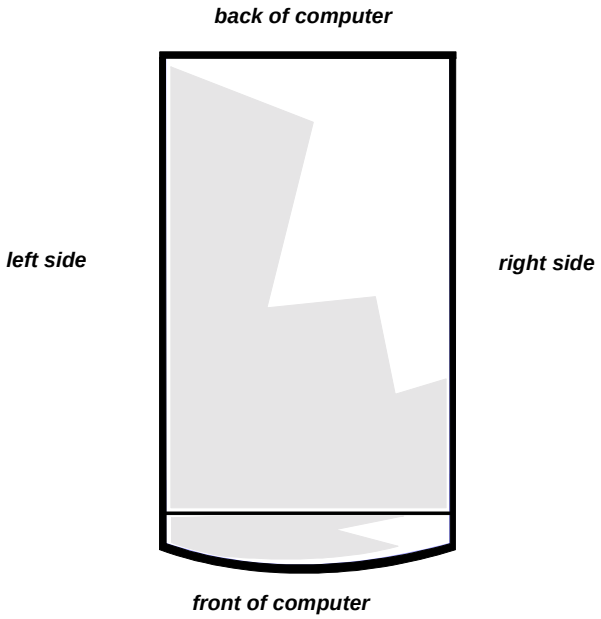


Figure 1-1. Computer Orientation

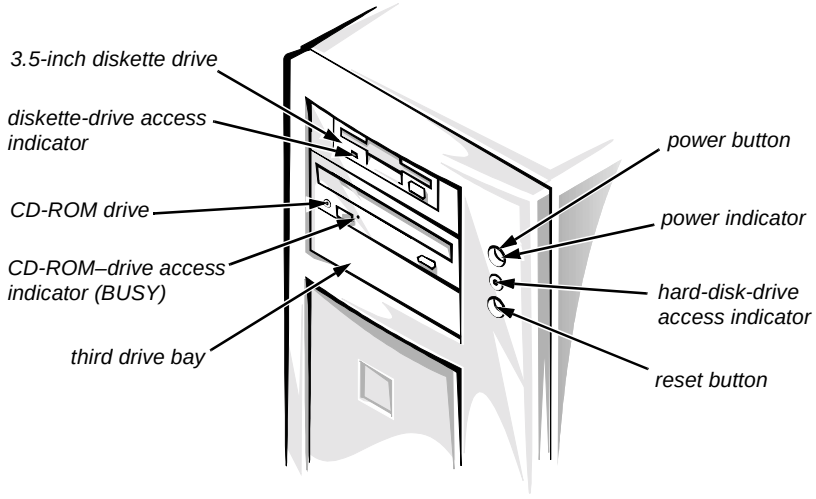


Figure 1-2. Front-Bezel Features

CAUTION: To avoid possible data or file structure corruptions, the front-bezel reset button should be used only when the system cannot be rebooted by pressing <CTRL><ALT><DEL>. Before you use the reset button to initiate a hardware reset, close any open application program and any files if possible.

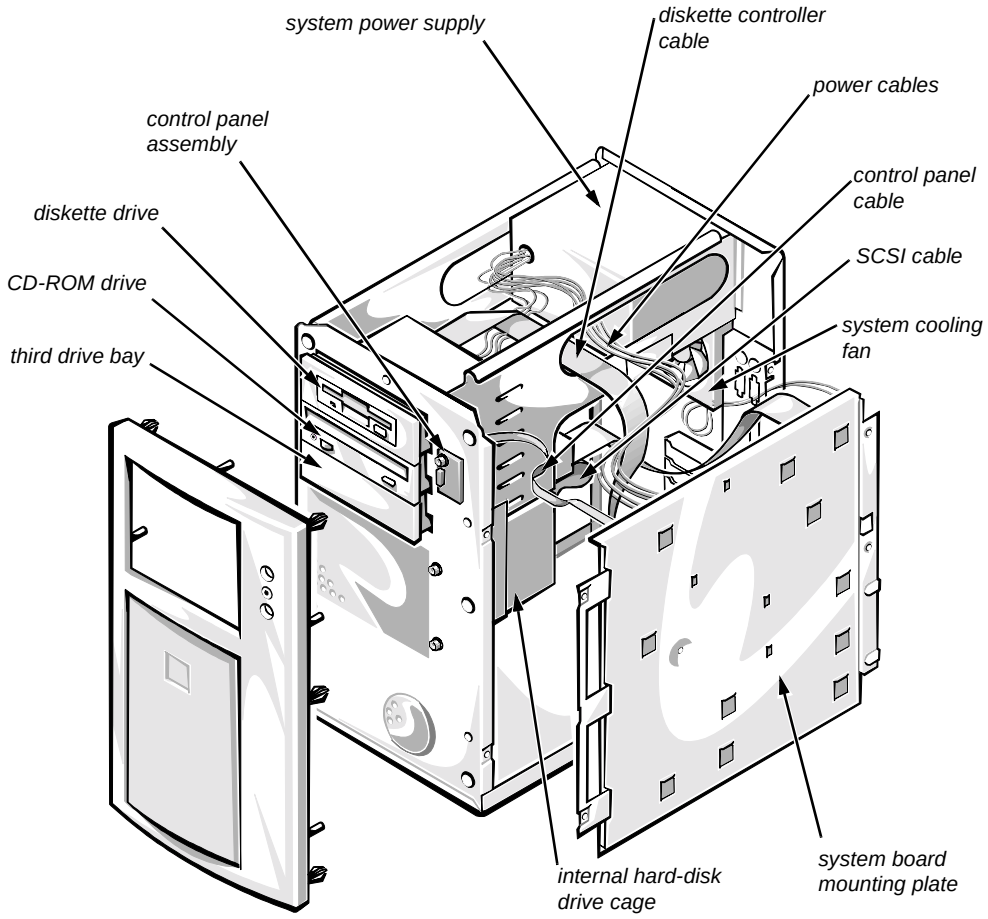


Figure 1-3. Front/Right Side Internal View

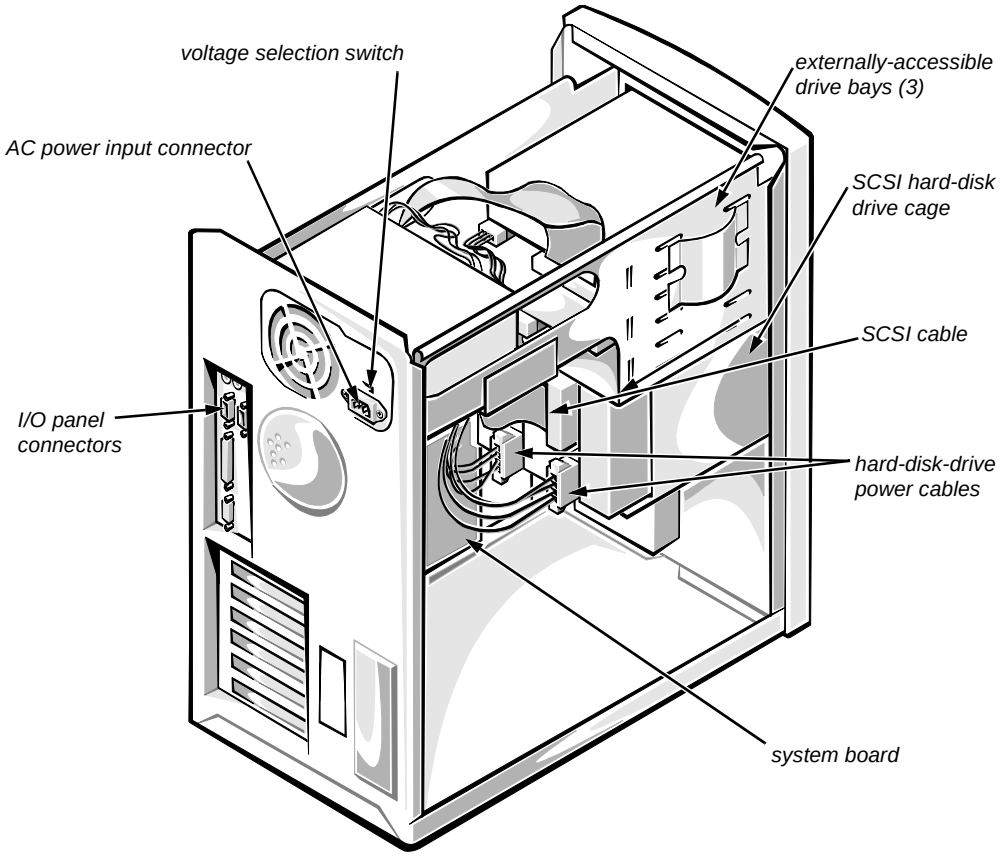


Figure 1-4. Back/Left Side Internal View

System Memory

System memory has a minimum of 16 MB of 72-bit wide, buffered, EDO-type memory. The system memory capacity can be expanded up to 256 MB by using combinations of 16-, 32-, and 128-MB buffered, EDO-type dual in-line memory modules (DIMMs).

The system board has four, 168-pin DIMM sockets. The DIMMs can be mixed. The socket population rules are as follows:

- Populate the DIMM sockets in order from DIMM_A (lower) to DIMM_D (upper).
- The DIMMs should be rated at 60 nanoseconds (ns) or faster. All of the system memory operates at the speed of the slowest DIMM installed.
- The largest capacity DIMM should be in socket DIMM_A with the smaller capacity DIMMs installed in decreasing sizes toward socket DIMM_D.

The 72-bit wide, buffered, EDO DIMMs support the ECC feature that detects memory errors and corrects single-bit memory errors. The ECC feature provides more reliable memory and less downtime. The ECC feature is built into the memory controller on the system board.

See “DIMMs” in Chapter 4 for information on removing and replacing DIMMs.

Advanced Expansion Subsystem

The computer system offers advanced expansion subsystems that can support a mixture of traditional EISA expansion cards, Plug and Play ISA expansion cards, and PCI expansion cards. The EISA Configuration Utility included with the system provides a means of avoiding resource conflicts that might arise from such an arrangement.

After all legacy cards have been configured with the EISA Configuration Utility, the system automatically assigns any required memory space, IRQ lines, and DMA channels to any installed Plug and Play ISA expansion cards and PCI expansion cards the next time the system is rebooted. Chapter 5, “Using the EISA Configuration Utility,” in the *User’s Guide* describes the EISA Configuration Utility and provides instructions for using it to configure the system.

The six expansion-card slots include three EISA expansion-card connectors and three PCI expansion-card connectors. The expansion-card connectors are located on the system board (see Figure 1-11).

Integrated Server Management

The system board contains integrated server management circuitry that monitors whether the system cooling fan is running, as well as critical system voltages and temperatures. The integrated server management circuitry works in conjunction with the Intel LANDesk® Server Management suite.

Video Controller

The video subsystem is built into the system board and consists of a high-speed, high-resolution VGA-compatible video subsystem. The video controller is connected to the PCI local bus. The standard video subsystem contains 1 MB of video memory (the video memory size is not upgradable).

Maximum noninterlaced resolutions are 640 x 480 pixels with 16.7 million colors or 800 x 600 pixels with 65,536 colors.

Maximum interlaced resolution is 1024 x 768 pixels with 256 colors.

Integrated SCSI Controller

A single-integrated SCSI controller provides an ultra (fast-20) wide, SCSI interface through a 68-pin connector on the system board. The integrated SCSI controller attaches to the PCI bus to provide a high-performance SCSI bus.

The integrated SCSI controller provides control for the three SCSI hard-disk drives in the SCSI hard-disk drive cage, the CD-ROM drive in the middle externally-accessible drive bay and a SCSI drive installed in the lower externally-accessible drive bay.

SCSI Hard-Disk Drives

A SCSI hard-disk drive cage is located under the externally-accessible drive bays at the front of the computer (see Figure 1-4). The SCSI hard-drive cage can contain up to three, 1.6-inch-high, SCSI hard-disk drives (either fast/wide or ultra [fast-20] wide). These SCSI hard-disk drives mount vertically. The SCSI hard-disk drive bays are populated from left to right (facing the front of the computer), so that the SCSI terminator jumper is accessible on the leftmost drive installed (last drive on the SCSI channel).

NOTE: The externally-accessible drive bays at the front of the computer are normally used for diskette drives, CD-ROM drives, and/or tape drives. Hard-disk drives should be installed in the SCSI hard-disk drive cage. For detailed information about installing externally-accessible drives, see Chapter 8, "Installing Drives in the External Bays," in the User's Guide*. For detailed information about installing SCSI hard-disk drives, see Chapter 9, "Installing Drives in the Internal Bays," in the* User's Guide*.*

SCSI Configuration Guidelines

Although SCSI devices are installed essentially the same way as other devices, their configuration requirements are different. To configure your SCSI subsystem, follow the general guidelines offered in the following subsections.

SCSI ID Numbers

Each device attached to the SCSI host adapter must have a unique SCSI ID number from 0 to 15. See Chapter 9, “Installing Drives in the Internal Bays” in the *User’s Guide* for additional SCSI addressing information.

NOTE: Any narrow SCSI devices installed in the external drive bays will require SCSI ID numbers less than 7.

When SCSI devices are shipped from Dell, the default SCSI ID numbers are assigned as follows:

- The computer’s built-in SCSI controller is configured through the BIOS as SCSI ID 7 (the default ID number for a host adapter) if the system includes a CD-ROM or tape drive.

  NOTE: If only wide SCSI hard-disk drives are connected to the built-in SCSI controller (no CD-ROM or tape drives), it may be configured as SCSI ID 15.

- A SCSI CD-ROM drive (installed in an externally-accessible drive bay) is configured as SCSI ID 5.
- A SCSI tape drive (if installed) is configured as SCSI ID 6.
- The drive you intend to use as your *boot device* should be configured as SCSI ID 0. You can configure any additional hard-disk drives to any of the still-available SCSI ID numbers.
- If Dell installs additional SCSI hard-disk drives in the system, they will be configured as SCSI ID 1 and SCSI ID 2.

*NOTE: There is **no** requirement that SCSI ID numbers be assigned sequentially or that devices be attached to the cable in order by ID number.*

Device Termination

Before installing SCSI devices, you must configure the termination on the device(s) and for the built-in SCSI controller according to the guidelines listed in the following text.

SCSI logic requires that termination be enabled for the two devices at opposite ends of the SCSI chain and disabled for all devices in between. To that end, regardless of whether you are installing internal or external devices, use the following guidelines:

- The built-in SCSI controller has active termination — no action is required.
- When the SCSI hard-disk drives are installed by Dell, termination is set to enabled on the SCSI hard-disk drive installed in the left bay of the SCSI hard-disk drive cage. Termination should be disabled on any other drives installed in the SCSI hard-disk drive cage. Figure 1-5 shows some examples of SCSI termination jumpers.

- If you install an optional SCSI controller card to control the CD-ROM drive and any other SCSI device in the externally-accessible drive bays, you must enable termination for the SCSI controller card and the SCSI device at the end of the SCSI interface cable (preferably the CD-ROM drive). See the documentation that came with your SCSI controller card for instructions. Figure 1-5 shows an example of a SCSI termination jumper on a CD-ROM drive.

NOTE: When you install or remove a termination jumper, do not move or remove any other jumpers installed on the drives.

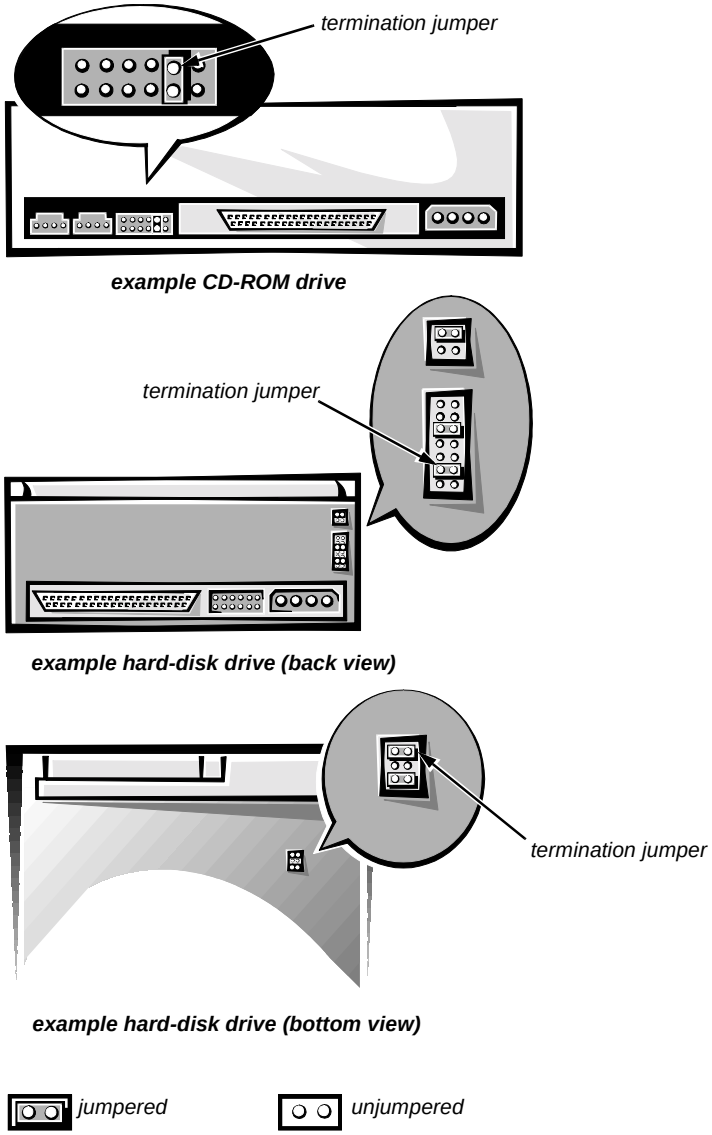


Figure 1-5. SCSI Termination Jumper Examples

System Unit

The following subsections provide service-related information about the computer.

System Power Supply

The 230-W system power supply can operate from an AC power source of 115 VAC at 60 Hz or 230 VAC at 50 Hz. The system power supply provides the DC operating voltages and currents listed in Table 1-1.

NOTE: The power supply produces DC voltages only under its loaded condition. Therefore, when you measure these voltages, the DC power connectors must be connected to their corresponding power input connectors on the system board or drives.

Table 1-1. DC Voltage Ranges

Voltage	Range	Maximum Output Current[1]
+3.3 VDC	+3.15 to +3.45 VDC	14.0 A
+5 VDC	+4.75 to +5.25 VDC	29.0 A
+12 VDC	+11.40 to +12.60 VDC	6.0 A[2]
–12 VDC	–10.80 to –13.20 VDC	0.3 A
–5 VDC	–4.50 to –5.50 VDC	0.3 A
+5 VFP[3]	+4.75 to +5.25 VDC	10 mA

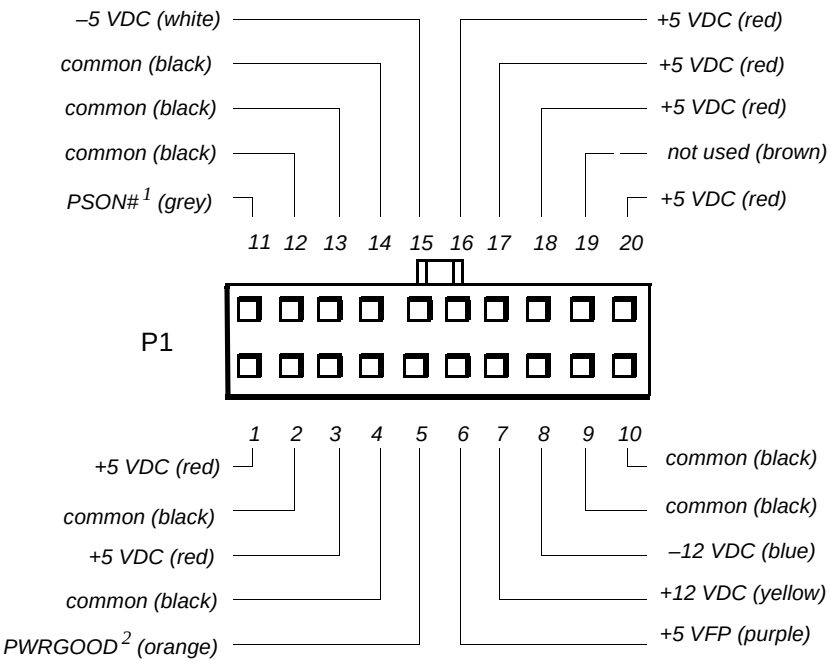
1 *Maximum continuous DC output power shall not exceed 230 W. Maximum combined load on +5 VDC and +3.3 VDC shall not exceed 170 W.*

2 *The total power of all voltages other than +12 VDC must not exceed 158 W.*

3 *VFP (volts flea power) — sometimes called "standby power."*

Pin Assignments for the DC Power Connectors

The power-supply output voltages can be measured at the back (wire side) of the connectors without disconnecting them. Figures 1-6, 1-7, and 1-8 show the wire side of the connectors.



1 *Pin 11 — PSON# should measure between +4 and +5 VDC except when the power button on the front panel is pressed, taking PSON# to its active-low state.*

2 *Pin 5 — PWRGOOD should measure between +4 and +5 VDC when the power supply is on and operating to indicate that all power-supply output voltages are within ranges specified in Table 1-1.*

Figure 1-6. DC Power Connector P1

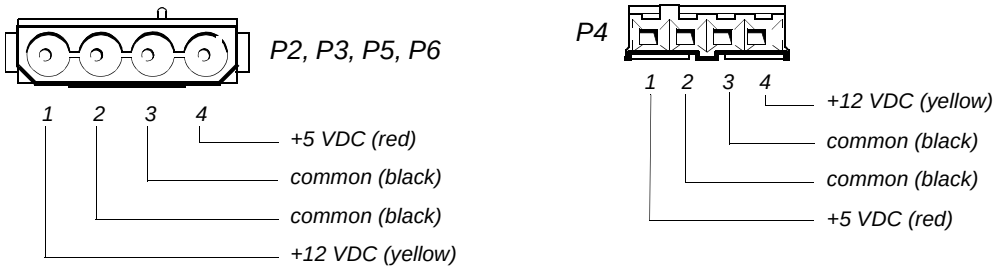


Figure 1-7. DC Power Connectors P2, P3, P4, P5, and P6

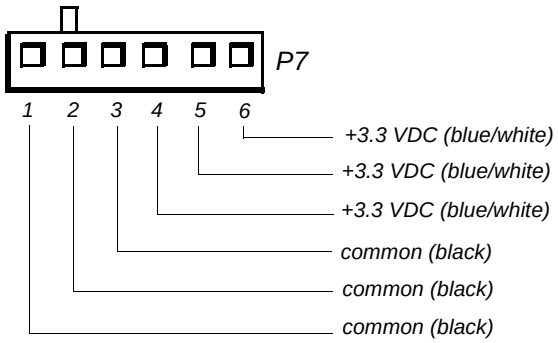


Figure 1-8. DC Power Connectors P7

DC Power Distribution

Figures 1-9 and 1-10 provide the following information about DC power distribution:

- Power-supply connector identification
- Power cable connections for diskette, tape, CD-ROM, and hard-disk drives
- Power distribution to sockets and connectors on the system board

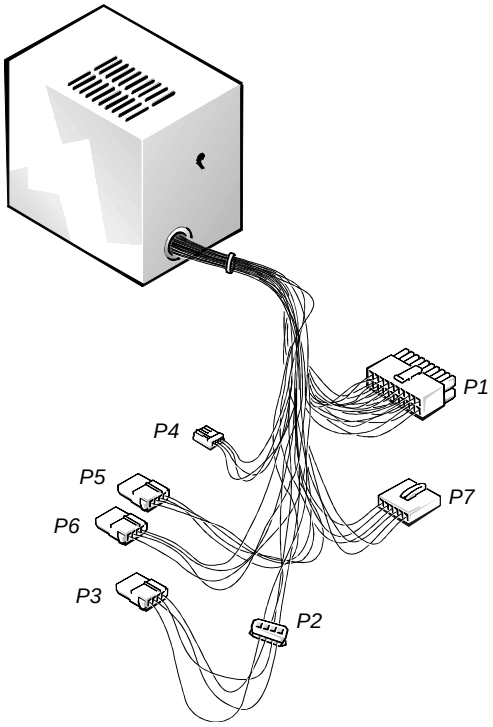


Figure 1-9. DC Power Cables

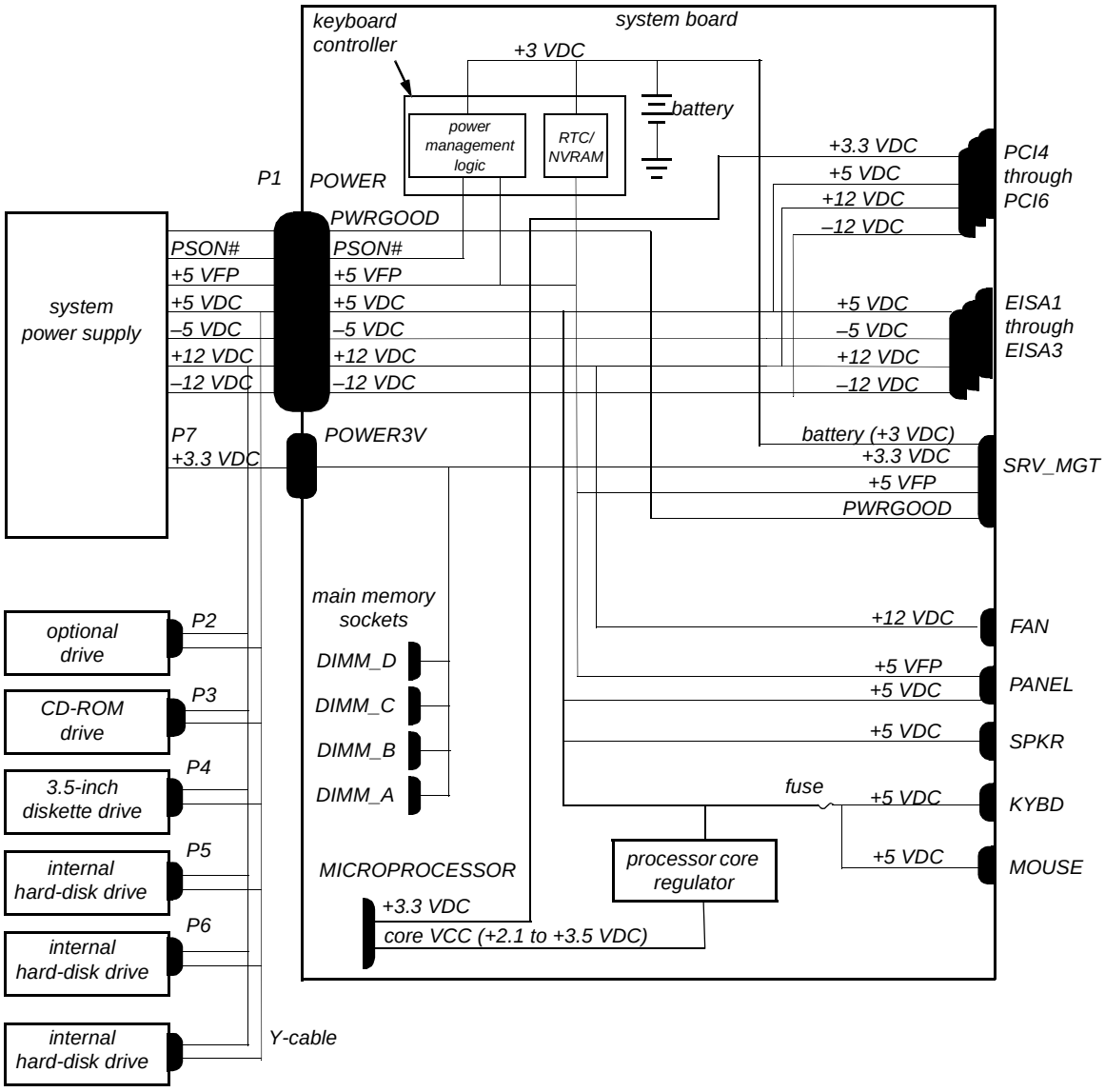


Figure 1-10. DC Power Distribution

System Board Layout

The subsections that follow provide service-related information about the system board components.

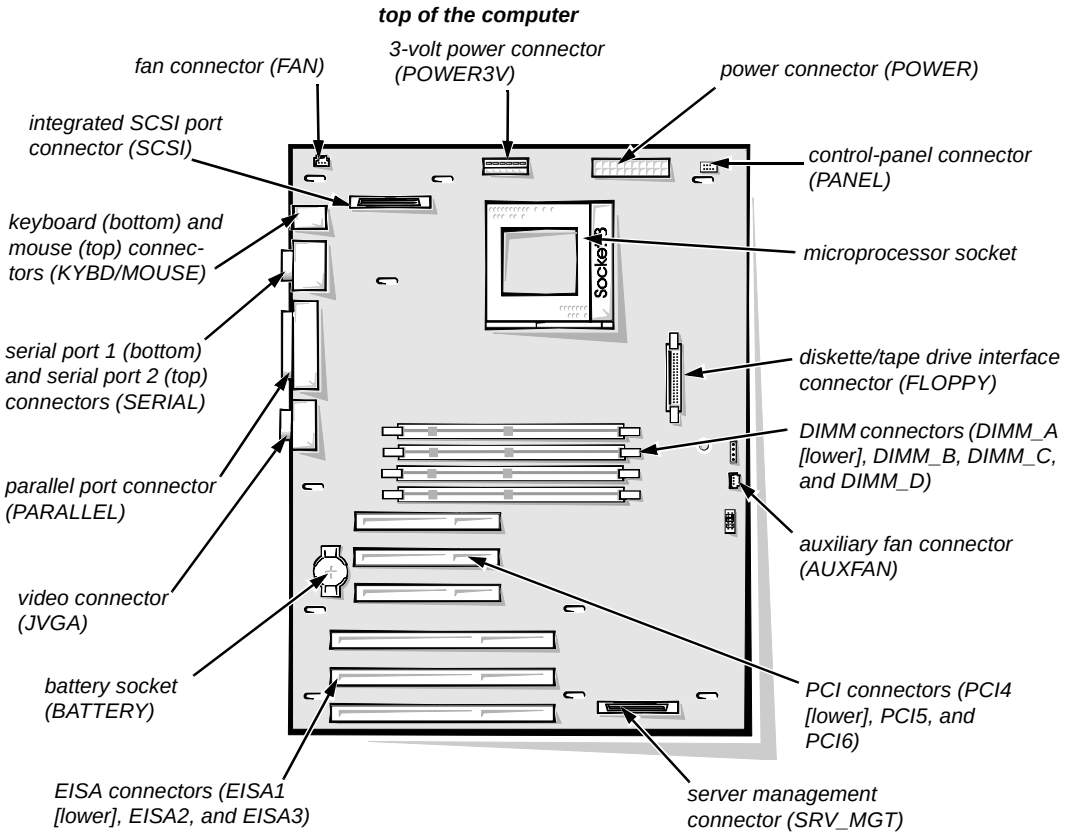

top of the computer
fan connector (FAN)
3-volt power connector (POWER3V)
power connector (POWER)
integrated SCSI port connector (SCSI)
control-panel connector (PANEL)
keyboard (bottom) and mouse (top) connectors (KYBD/MOUSE)
microprocessor socket
Socket 3
serial port 1 (bottom) and serial port 2 (top) connectors (SERIAL)
diskette/tape drive interface connector (FLOPPY)
DIMM connectors (DIMM_A [lower], DIMM_B, DIMM_C, and DIMM_D)
parallel port connector (PARALLEL)
auxiliary fan connector (AUXFAN)
video connector (JVGA)
battery socket (BATTERY)
PCI connectors (PCI4 [lower], PCI5, and PCI6)
EISA connectors (EISA1 [lower], EISA2, and EISA3)
server management connector (SRV_MGT)

Figure 1-11. System Board Components

System Board Jumper

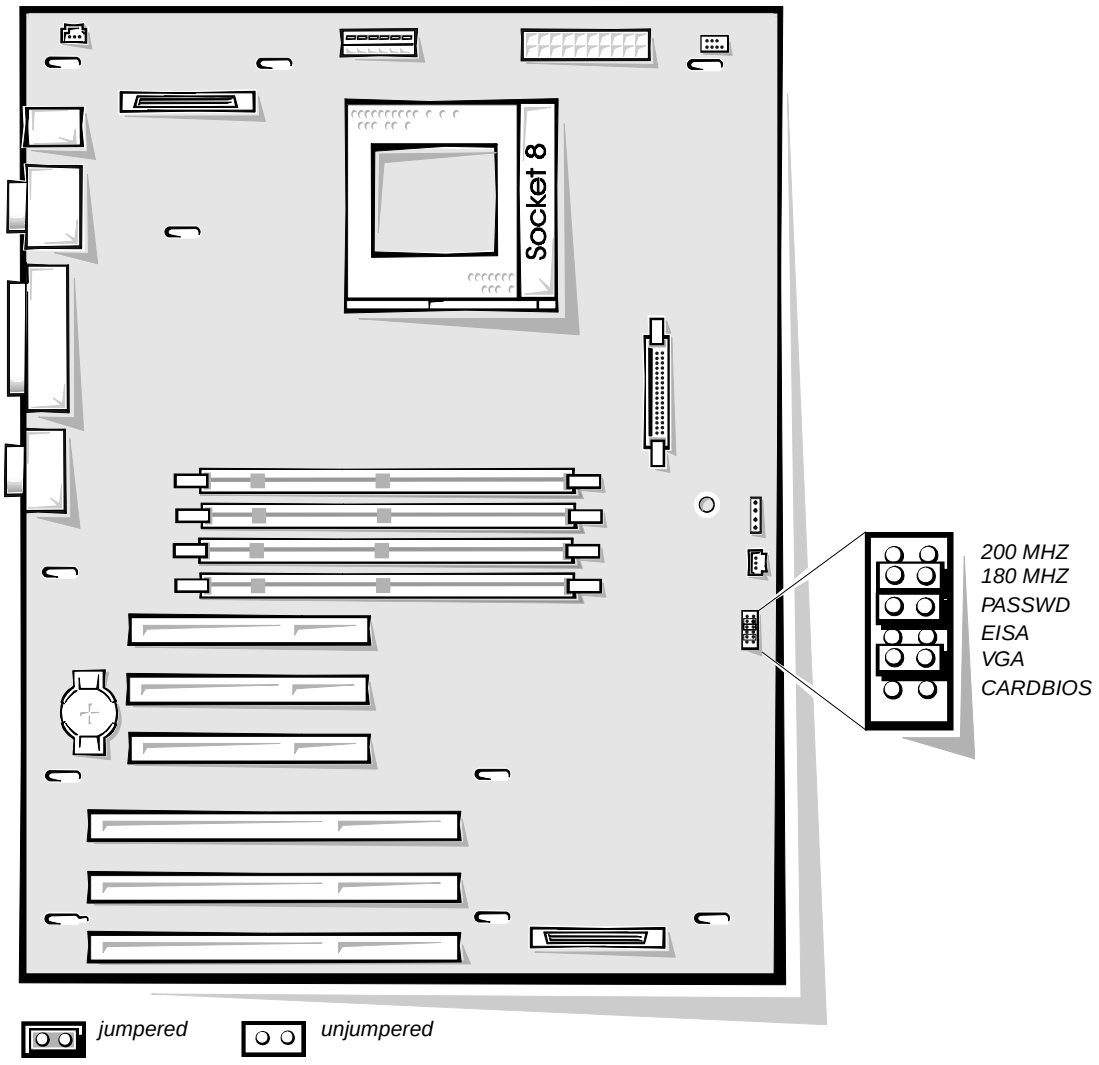


Figure 1-12. System Board Jumpers

Table 1-2. Jumper Descriptions

Jumper	Description	Settings
200MHZ	Microprocessor speed	Installed if the microprocessor's internal speed is 200 MHz, otherwise, not installed.
180MHZ	Microprocessor speed	Installed if the microprocessor's internal speed is 180 MHz, otherwise, not installed.
PASSWD	Password enable/disable	Jumper installed to activate boot password feature.
EISA	Clear EISA configuration settings	Install the jumper and boot the system to clear the configuration settings. Remove the jumper and use the EISA Configuration Utility to configure the system.
VGA	Integrated VGA controller enable/disable	Install to enable the integrated VGA controller.
CARDBIOS	Used for trouble shooting	Install the jumper to boot system from BIOS expansion card. Remove the jumper to allow normal boot operation from BIOS.

Interrupt Assignments

Table 1-3. Interrupt Assignments

IRQ Line	Used By/Available
IRQ0	Generated by system timer.
IRQ1	Generated by keyboard controller to indicate that keyboard's output buffer is full.
IRQ2	Generated internally by interrupt controller to enable IRQ8 through IRQ15.
IRQ3 and IRQ4	Generated by super I/O controller to indicate that device connected to corresponding serial port requires service (IRQ3 for COM2 or COM4; IRQ4 for COM1 or COM3).
IRQ5	Available for use by expansion card unless this IRQ line is used by secondary parallel port.
IRQ6	Generated by super I/O controller to indicate that diskette or tape drive requires service.
IRQ7	Generated by super I/O controller to indicate that device connected to parallel port requires service.
IRQ8	Generated by keyboard controller for each tick of RTC.
IRQ9	Available for use by expansion card.
IRQ10	Available for use by expansion card.
IRQ11	Available for use by expansion card.
IRQ12	Generated by keyboard controller to indicate that mouse's output buffer is full.
IRQ13	Generated by math coprocessor to indicate coprocessor error.
IRQ14	Available for use.
IRQ15	Available for use.

DMA Channel Assignments

Table 1-4. DREQ Line Assignments

DREQ Line	Used By/Available
DREQ0	Available
DREQ1	Available
DREQ2	Generated by super I/O controller to initiate DMA cycle for attached diskette drive
DREQ3	Available
DREQ4	Generated by bus controller chip to activate second DMA controller
DREQ5	Available
DREQ6	Available
DREQ7	Available

Technical Specifications

Table 1-5. Technical Specifications

Microprocessor	
Microprocessor type . . .	Intel Pentium Pro microprocessor
Microprocessor speed . .	200 or 180 MHz
Internal cache	256 KB
Math coprocessor	internal to the microprocessor
System Information	
System chip set	Intel 440FX controller chip set
Data bus width	64 bits
Address bus width.	32 bits
Expansion Bus	
Bus types.	PCI and EISA
Bus speed	PCI: 30 MHz with the 180 MHz microprocessor; 33 MHz with the 200 MHz microprocessor EISA: 7.5 MHz with the 180 MHz microprocessor; 8.33 MHz with the 200 MHz microprocessor
PCI expansion-card connectors	three (no shared expansion-card slots)
EISA expansion-card connectors	three (no shared expansion-card slots)
System Clocks	
System clock.	60 or 66 MHz (matches external processor speed)
Diskette/communications ports	24 MHz from the system clock
Memory	
Architecture	72-bit (64 data bits plus 8 parity bits), noninterleaved, buffered, EDO-type memory
DIMM sockets	four 168-pin sockets
DIMM capacities	16, 32, and 128 MB (DIMMs are 60 ns or faster, EDO)
Standard RAM	16 MB
Maximum RAM	256 MB
BIOS address	F000:0000h–F000:FFFFh

Table 1-5. Technical Specifications *(Continued)*

Integrated SCSI Controller	
Type	Adaptec AIC-7880 ultra wide SCSI controller with integrated 68-pin SCSI connector on the system board
Drives	
Externally accessible bays.	one 5.25-inch bay (upper bay) dedicated to a 3.5-inch diskette drive; one 5.25-inch bay (middle bay) containing a CD-ROM drive; one 5.25-inch bay (lower bay) for a tape drive or CD-ROM drive
Internally accessible bays.	three hard-disk drive bays for SCSI hard-disk drives up to 1.6-inch-high
Ports	
Externally accessible:	
Serial (DTE)	two 9-pin connectors; 16550-compatible
Parallel	one 25-hole connector (bidirectional)
Video	one 15-hole connector (VGA compatible)
PS/2-style key-board.	6-pin mini-DIN
PS/2-compatible mouse	6-pin mini-DIN
Internally accessible:	
SCSI controller. . . .	one 68-pin ultra (fast-20) wide connector
Diskette drive	34-pin connector
Controls and Indicators	
Reset control.	push button
Power control	push button
Power indicator.	green LED
Diskette-drive access indicator	green LED
Hard-disk drive access indicator	green LED
CD-ROM drive access indicator	green LED

Table 1-5. Technical Specifications *(Continued)*

Video	
Video type	ATI mach64 (264VT) PCI video controller with integrated VGA connector
Video memory (standard)	1 MB (not upgradable)
Power	
DC power supply:	
Wattage	230 W
Voltage	90 to 135 V at 60 Hz; 180 to 265 V at 50 Hz
Backup battery	3.0-V CR2032 lithium coin cell
Physical	
Height	44.45 cm (17.5 inches)
Width.	24.13 cm (9.5 inches)
Depth.	41.91 cm (16.5 inches)
Weight (maximum)	17.68 kg (39.0 lb)
Environmental	
Temperature:	
Operating	10° to 35°C (50° to 95°F)
Storage	-40° to 65°C (-40° to 149°F)
Relative humidity . .	8% to 80% (noncondensing)
Maximum vibration:	
Operating	0.25 G at 3 to 200 Hz for 30 min
Storage	0.5 G at 3 to 200 Hz for 30 min
Maximum shock:	
Operating	half-sine wave form: 50 G for 2 ms
Storage	half-sine wave form: 110 G for 2 ms; square wave form: 27 g for 15 ms
Altitude:	
Operating	-16 to 3048 m (-50 to 10,000 ft)
Storage	-16 to 10,600 m (-50 to 35,000 ft)

Chapter 2
Basic Troubleshooting

This chapter describes basic troubleshooting procedures that can help you diagnose a computer system problem. These procedures can often reveal the source of a problem or indicate the correct starting point for troubleshooting the system. A brief explanation of how to load and start the diskette-based diagnostics is located at the end of the chapter. Dell recommends that you perform the following procedures in the order they are presented in this manual.

Initial User Contact

When you first contact a user who has a problem, ask the user to describe the problem and the conditions under which it occurs. A verbal description can often indicate the cause of a problem or indicate the appropriate troubleshooting procedure to use. After the user describes the problem, follow these steps:

1. **Ask the user to back up any data on the hard-disk drive if the system's condition permits.**

   Appendix C, "Maintaining the System," in the *User's Guide* provides information about backing up data.

2. **Ask the user to try to duplicate the problem by repeating the operations he or she was performing at the time the problem occurred.**

   Can the user duplicate the problem?

   ***Yes*.** Proceed to step 3.

   ***No*.** Proceed to the next section, "External Visual Inspection."

3. **Observe the user to determine if he or she is making an error, such as typing an incorrect key combination or entering a command incorrectly.**

   Is the problem a result of user error?

   ***Yes*.** Instruct the user in the proper procedure, or direct him or her to the appropriate user documentation for the correct procedure.

   ***No*.** Proceed to the next section, "External Visual Inspection."

External Visual Inspection

The external visual inspection is a quick inspection of the exterior of the system unit, the monitor, the keyboard, any peripherals, and cables. While performing the visual inspection, make any necessary corrections. To perform the external visual inspection, follow these steps:

1. **Turn off the system unit, the monitor, and all peripherals.**
2. **Verify that all power cables are properly connected to the system unit, the monitor and peripherals, and their power sources.**
3. **Verify that the keyboard and mouse interface cables are firmly attached to the proper connectors on the back of the system unit.**

   For a PS/2-compatible mouse, the keyboard and mouse interface cable connectors are identical except for their labels. If needed, see "System Features" in Chapter 1.

   For a serial mouse, the mouse interface cable must be firmly attached to one of the serial port connectors, and its captive screws must be secure enough to ensure a firm connection.
4. **If present, verify that any network cables are attached properly.**
5. **Verify that any devices attached to the serial and parallel port connectors are properly connected.**

   Each of the serial and parallel interface cables must be firmly attached to an appropriate connector on the back of the system unit as well as to the interface connector on the device. The captive screws that secure these connectors at each end of the interface cable must be secure enough to ensure a firm connection.
6. **Verify that the video interface cable is firmly attached to the connector on the back panel or to a video expansion card and to the connector on the back of the monitor.**

   For proper connection of the video monitor, see the documentation for the monitor.
7. **Inspect all external monitor controls for any obvious damage or improper settings.**

   For proper settings of the video monitor controls, see the documentation for the monitor.
8. **Inspect the keyboard to ensure that no keys are sticking.**

   If one or more keys are sticking, it may be necessary to replace the keyboard.

9. **Inspect the exterior of the system unit, including all controls and indicators, and all user-accessible data storage devices for any signs of physical damage.**

   Does the inspection reveal any problems?

   Yes. Proceed to the appropriate procedure in Chapter 4, "Removing and Replacing Parts."

   No. Proceed to the next section, "Observing the Boot Routine."

Observing the Boot Routine

After you have performed an external visual inspection as described in the previous section, you should boot the system and, while the boot routine is running, observe the system for any indications of problems.

NOTE: Most of the steps in this procedure require observation of system functions and indications, some of which can occur simultaneously. It may be necessary to reboot the system several times in order to complete all of these steps.

To observe problem indications during the boot routine, follow these steps:

1. **Insert the diagnostics diskette into drive A. Turn on all peripherals and the system unit. If the system unit is already on, press the reset button or <CTRL><ALT><DEL> to reboot the system.**
2. **Check the power supply fan.**

   Does the fan run normally?

   Yes. Proceed to step 3.

   No. Troubleshoot the system power supply.
3. **Watch the Num Lock, Caps Lock, and Scroll Lock indicators on the upper-right corner of the keyboard. After all three indicators flash momentarily, the Num Lock indicator should light up and remain on.**

   Do these indicators flash on and off within approximately ten seconds after the boot routine starts?

   Yes. Proceed to step 4.

   No. Troubleshoot the system power supply. If the troubleshooting procedure indicates that the system power supply is operational, troubleshoot the memory.

4. **During the boot routine, observe the system for any of the following:**

   - *Diskette-drive and hard-disk drive access indicators*: These indicators light up in response to data being transferred to or from the drives. If either of these indicators fails to light up during the boot routine, troubleshoot the diskette drive or hard-disk drive subsystem, as appropriate.
   - *System error messages:* These messages can indicate problems or provide status information. If a system error message is displayed, see Table 3-2.
   - *Beep codes:* A beep code is a series of beeps that indicates an error condition. If the system emits a beep code, see Table 3-1.

     NOTE: The system beeps once during the boot routine. This single beep is normal and is not a beep code.

5. **Observe the monitor screen for the Diagnostics Menu.**

   Does the Diagnostics Menu appear?

   Yes. See "Running the Diskette-Based Diagnostics" found later in this chapter.

   No. Proceed to step 6.

6. **Insert another copy of the diagnostics diskette into the diskette drive, and reboot the system.**

   Does the Diagnostics Menu appear?

   Yes. See "Running the Diskette-Based Diagnostics" found later in this chapter.

   No. Proceed to the next section, "Internal Visual Inspection."

Internal Visual Inspection

CAUTION: Before you proceed with the internal visual inspection described in this section, ensure that the user has saved all open files and exited all open application programs if possible.

A simple visual inspection of a system unit's interior hardware can often lead to the source of a problem, such as a loose expansion card, cable connector, or mounting screw. When you perform the visual inspection, refer to "System Features" in Chapter 1 to locate components in the inspection procedure.

To perform the internal visual inspection, follow these steps:

1. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources.**
2. **Remove the system unit cover.**

3. **Verify that the microprocessor, DIMMs, and expansion cards, are fully seated in their sockets or connectors.**

   WARNING: The microprocessor can get extremely hot. Be sure the chip has had sufficient time to cool before you touch it.

   While reseating the microprocessor, wear a wrist grounding strap or maintain contact with a metal surface on the chassis.

   To reseat the microprocessor, remove it from its socket and reinstall it as described in "Microprocessor/Heat Sink Assembly" in Chapter 4.

   To reseat a DIMM, remove it from its socket and reinstall it as described in "DIMMs" in Chapter 4.

   If you need to reseat an expansion card, use a 1/4-inch nut driver to remove the screw that secures the card-mounting bracket. Grasp the card by its top corners, and carefully pull it out of its connector. Reinsert the card in its connector, and carefully push it in until it is fully seated. Then reinstall the card-mounting bracket's retaining screw.

4. **Verify that all jumpers are set correctly.**

   For information about these jumpers, see "System Board Jumpers" in Chapter 1.

5. **Check all cable connectors inside the system unit to verify that they are firmly attached to their appropriate connectors.**
6. **Reinstall the system unit cover.**
7. **Reconnect the system unit and any attached peripherals to their power sources, and turn them on.**

   Does the problem appear to be resolved?

   Yes. No further steps are necessary. Terminate the procedure.

   No. Proceed to the next sections, "Eliminating Resource Conflicts," "Running the Diskette-Based Diagnostics," and to "Getting Help."

Eliminating Resource Conflicts

Devices within the system unit may require dedicated memory spaces, interrupt levels, or DMA channels, all of which must be allocated during installation of the devices. Because a device may be installed at a different time, it is possible that the same resource is assigned to two or more devices.

Resource conflicts can result in disorderly or erratic system operation or system failure. If you suspect that resource conflicts might exist, check the system and reassign the resources as necessary.

For additional information, see Chapter 5, "Using the EISA Configuration Utility" in the *User's Guide*.

Running the Diskette-Based Diagnostics

The diskette-based diagnostics (included with the system) contain tests that aid in troubleshooting all major components of the computer system.

CAUTION: To prevent damage to the original diagnostics diskette, always use a backup copy of the diagnostics diskette when servicing a user's system. Dell recommends that users make several copies of this diskette to ensure that one is always available.

To start the diagnostics, turn off the system unit, insert a diagnostics diskette into drive A, and then turn on the system unit.

Starting the diagnostics causes the Dell logo screen to appear on the monitor screen, followed by a message indicating that the diagnostics is loading. Before the diagnostics loads, a program tests the portion of main memory (RAM) required for loading the diagnostics. If a main memory error is detected, a message appears on the screen telling you which DIMM has failed.

If no errors are found in main memory, the diagnostics loads and the Diagnostics Menu appears. This menu lets you choose the following options or exit to the Microsoft® MS-DOS® prompt:

- **RUN QUICK TESTS** — Runs selected tests from all test groups to quickly locate a failure or to indicate where further testing is needed to isolate a failure
- **RUN ALL TESTS** — Runs all tests for a thorough test of the system
- **RUN SPECIFIC TESTS** — Tests a particular area or subsystem

Getting Help

If none of the troubleshooting procedures in this chapter or the tests in the diskette-based diagnostics reveals the source of the problem or leads to the proper troubleshooting steps for determining the source of the problem, call Dell for technical assistance. For instructions, see the chapter titled "Getting Help" in the *Diagnostics and Troubleshooting Guide.*

Chapter 3
Beep Codes and Error Messages

This chapter describes beep codes and system error messages that can occur during POST or, in the case of some failures, during normal system operation. The tables in this chapter list faults that can cause a beep code or system error message to occur and the probable causes of the fault in each case.

If a faulty system does not emit beep codes or display system error messages to indicate a failure, you should use the diskette-based diagnostics to run the appropriate tests to help isolate the source of the problem. See “Running the Diskette-Based Diagnostics” in Chapter 2.

POST Beep Codes

If the monitor cannot display error messages during the POST, the system may emit a series of beeps that identifies the problem or that can help you identify a faulty component or assembly. Table 3-1 lists the beep codes that may be generated during the POST. Most beep codes indicate a fatal error that prevents the system from completing the boot routine until the indicated condition is corrected.

When the system emits a beep code, record the code and then find it in Table 3-1. If the table does not lead to the source of the problem, run the appropriate tests in the diskette-based diagnostics to assist in troubleshooting the problem.

Table 3-1. POST Beep Codes

Beep Code	Error	Probable Causes
1-2	Invalid Expansion-card-ROM checksum	Improperly seated expansion card or the system needs rebooted.
1-2-2-3	Invalid BIOS ROM checksum	Corrupted BIOS firmware or defective system board.
1-3-1-1	DRAM refresh failure	Defective DIMMs or system board. Reseat the DIMMs or replace the system board.

Table 3-1. POST Beep Codes *(Continued)*

Beep Code	Error	Probable Causes
1-3-1-3	Keyboard controller error	Defective DIMMs or system board. Reseat the DIMMs or replace the system board.
1-3-3-1	No DIMM memory installed	Defective DIMMs or system board. Reseat the DIMMs or replace the system board.
1-3-4-1	DRAM failure	Defective DIMMs or system board. Reseat the DIMMs or replace the system board.
1-3-4-3	DRAM failure	Defective DIMMs or system board. Reseat the DIMMs or replace the system board.
1-4-1-1	DRAM failure	Defective DIMMs or system board. Reseat the DIMMs or replace the system board.
1-4-2-1	CMOS failure	Defective system board.
1-4-3-1	Memory controller or DIMM failure	Defective DIMMs or system board. Reseat the DIMMs or replace the system board.
2-1-2-3	Invalid ROM copyright notice	Defective system board.
2-2-3-1	Unexpected interrupt	Improperly seated expansion card or the system needs rebooted.
3-2-2-1	Gate A20 failure	Defective system board.
4-2-4-3	Keyboard controller error	Defective DIMMs or system board. Reseat the DIMMs or replace the system board.
4-2-4-4	Gate A20 failure	Defective system board.

System Error Messages

Table 3-2 lists (in alphabetical order) system error messages that can appear on the monitor screen. These messages can help you find the source of a problem. Some of these error messages indicate fatal errors. When a fatal error occurs, the system cannot usually be rebooted until an appropriate hardware change has been made.

Table 3-2. System Error Messages

Message	Definition	Probable Causes
`System battery is dead - Replace and run Setup`	The system battery is dead.	Replace the battery and run the System Setup program.
`System CMOS checksum bad - Run Setup`	The configuration data is corrupted.	Run the System Setup program to restore your system configuration.
`Incorrect drive A type - Run Setup`	The diskette drive does not match the diskette drive type stored in the configuration data.	Run the System Setup program to restore your system configuration.
`Incorrect drive B type - Run Setup`	The diskette drive does not match the diskette drive type stored in the configuration data.	Run the System Setup program to restore your system configuration.
`Keyboard error`	A cable may be loose, or the keyboard may be faulty.	Defective keyboard, keyboard cable, or system board.
`Stuck key`	A cable may be loose, or the keyboard may be faulty.	Defective keyboard or keyboard cable.
`System/ Shadow RAM failed at offset:`	One or more DIMMs may be improperly seated or faulty.	Reseat the DIMMs or replace the DIMMs.

Table 3-2. System Error Messages *(Continued)*

Message	Definition	Probable Causes
`Operating system not found`	The system did not find a bootable operating system.	Use a diskette with a bootable operating system on it in drive A, or load a bootable operating system from the hard-disk drive.
`System cache error - Cache disabled`	The microprocessor chip malfunctioned.	Defective microprocessor or system board.
`System timer error`	A chip on the system board malfunctioned.	Defective microprocessor or system board.
`Real-time clock error`	The real-time clock on the system board malfunctioned.	Defective microprocessor or system board.
`Keyboard controller error`	A cable may be loose, the keyboard may be faulty, or the keyboard controller is defective.	Defective keyboard, keyboard cable, or system board.
`EISA configuration NVRAM bad`	The EISA jumper may have been accidentally installed.	Be sure the EISA jumper is removed; then reboot the system, and restore the EISA configuration.
`EISA configuration error`	The EISA configuration data in NVRAM does not match the installed EISA expansion cards.	Be sure the EISA expansion cards are properly seated; then run the EISA configuration utility.
`Invalid CPU speed detected - Check jumpers`	The microprocessor speed jumper plug may be absent or installed on the wrong jumper pins.	Check the microprocessor speed jumpers.
`Memory size limit exceeded`	The size of installed DIMM memory is greater than 256 MB.	Verify that the total installed DIMM memory does not exceed 256 MB.

Table 3-2. System Error Messages *(Continued)*

Message	Definition	Probable Causes
`Resource conflict`	The BIOS detected a resource conflict while configuring a Plug and Play ISA or PCI expansion card.	See “Eliminating Resource Conflicts” in Chapter 2.
`Warning: IRQ not initialized`	The BIOS detected a resource conflict while configuring a Plug and Play ISA or PCI expansion card.	See “Eliminating Resource Conflicts” in Chapter 2.
`Expansion ROM not initialized`	The BIOS detected a resource conflict while configuring a Plug and Play ISA or PCI expansion card.	See “Eliminating Resource Conflicts” in Chapter 2.
`System configuration data write error`	The system board may be malfunctioning.	Defective system board.
`System memory size has changed - Run Configuration Utility`	A DIMM was added or removed. The DIMMs are improperly seated.	Reseat the DIMMs or replace the DIMMs.

Chapter 4
Removing and Replacing Parts

This chapter provides procedures for removing the components, assemblies, and subassemblies in the computer. Unless otherwise noted, each procedure assumes the following:

- You have performed the steps in “Precautionary Measures” found later in this chapter.
- You have removed the computer cover.
- You can replace or reinstall a part by performing the removal procedure in reverse order unless additional information is provided.

Recommended Tools

Most of the procedures in this chapter require the use of one or more of the following tools:

- Small flat-blade screwdriver
- Wide flat-blade screwdriver
- Number 1 and number 2 Phillips-head screwdrivers
- 1/4-inch nutdriver
- Tweezers or long-nose pliers

Also, use a wrist grounding strap as explained in the next section, “Precautionary Measures.”

Precautionary Measures

Before you perform any of the procedures in this chapter, take a few moments to read the following warning for your personal safety and to prevent damage to the computer from ESD.

WARNING FOR YOUR PERSONAL SAFETY AND PROTECTION OF THE EQUIPMENT: Before you start to work on the computer, perform the following steps in the sequence listed.

1. **Turn off the computer and any attached peripherals.**
2. **Disconnect the computer and any attached peripherals from their power sources to reduce the potential for personal injury.**
3. **Disconnect any communications cables.**
4. **Wear a wrist grounding strap, and clip it to an unpainted metal surface, such as the system power supply's fan guard, on the computer chassis.**

   If a wrist grounding strap is not available, touch the fan guard or some other unpainted metal surface on the back of the computer to discharge any static charge from your body.

Computer Cover

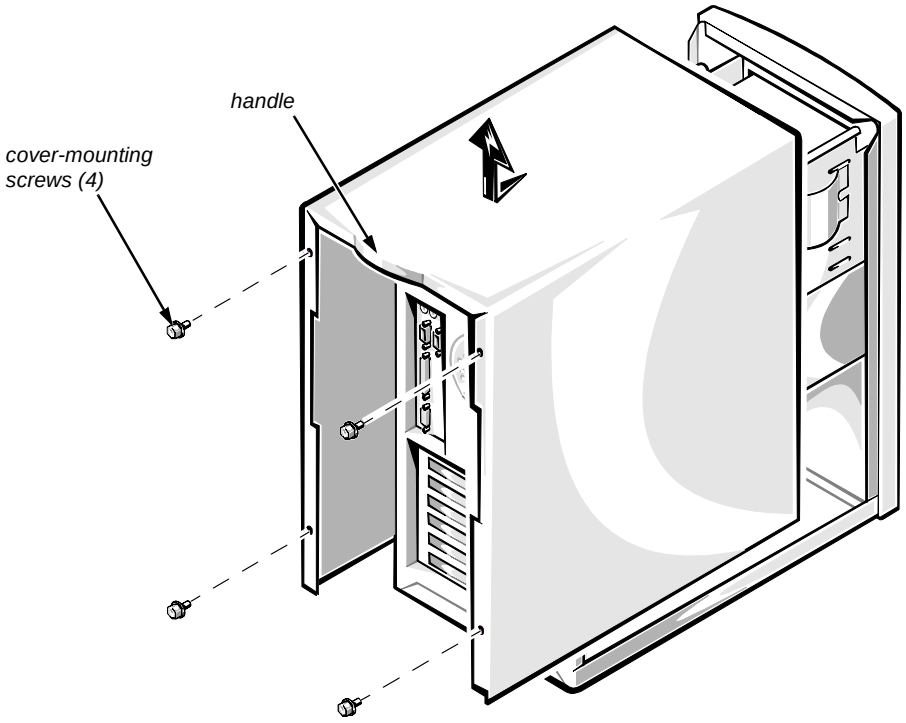


Figure 4-1. Computer Cover Removal

To remove the computer cover, follow these steps:

1. **Remove the four cover-mounting screws at the back of the computer.**
2. **Slide the cover backward about one inch, then grasp the front of the cover and the handle at the back of the cover and lift the cover straight up off the chassis.**

Front Bezel

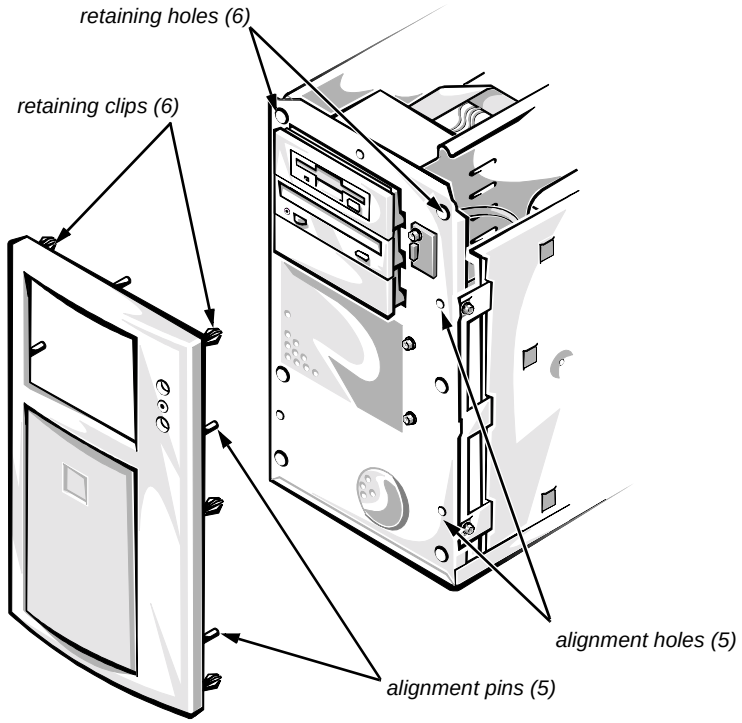


Figure 4-2. Front Bezel Removal

To remove the front bezel, follow these steps:

1. **Remove the computer cover.**
2. **Pry the front bezel loose with your finger tips and remove it from the chassis.**

   As you pry the front bezel loose, pry at different points around the bezel to keep the opening between the front bezel and the computer chassis equal on all sides to prevent damage to the bezel alignment pins.

Front-Bezel Inserts

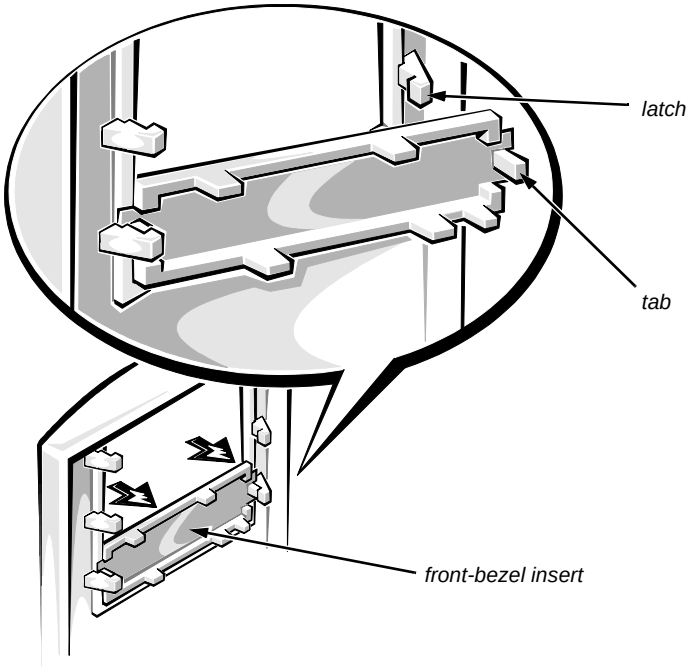


Figure 4-3. Front-Bezel Insert Removal

To remove a front-bezel insert, follow these steps:

1. **Remove the front bezel.**
2. **With the inside of the front bezel facing you; grasp the front bezel with both hands and place your fingers on the outside of the front-bezel insert.**
3. **Push on the outside of the front-bezel insert (indicated by the two arrows); then twist the sides of the front bezel outward until the front-bezel insert is released.**

To replace a front-bezel insert, position one end of the insert in place under its latch; then press the other end into place until the tab snaps under the latch.

Control Panel Assembly

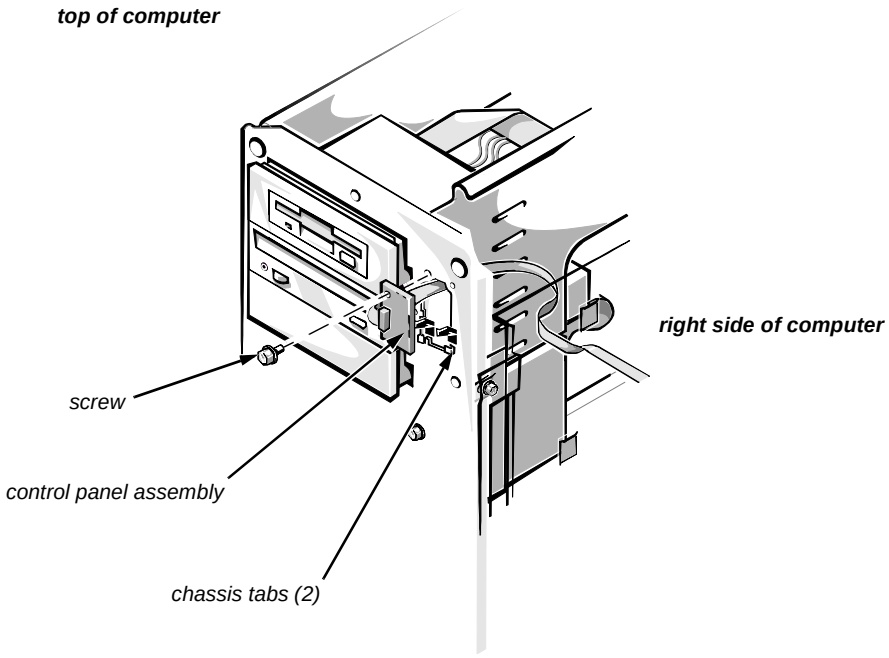


Figure 4-4. Control-Panel Assembly Removal

To remove the control panel assembly, follow these steps:

1. **Disconnect the control-panel assembly cable from the PANEL connector on the system board (see Figure 4-12).**

   The PANEL connector is near the top of the system board on the right side of the computer chassis.

2. **Remove the screw holding the control panel assembly to the front of the computer chassis.**
3. **Lift the control panel assembly out of the two chassis tabs.**
4. **Remove the control-panel-assembly cable from the hole in the chassis.**

Drives

Figure 4-5 shows an example of drive hardware that can be installed in the computer. Refer to this figure when you perform any of the procedures in the following subsections.

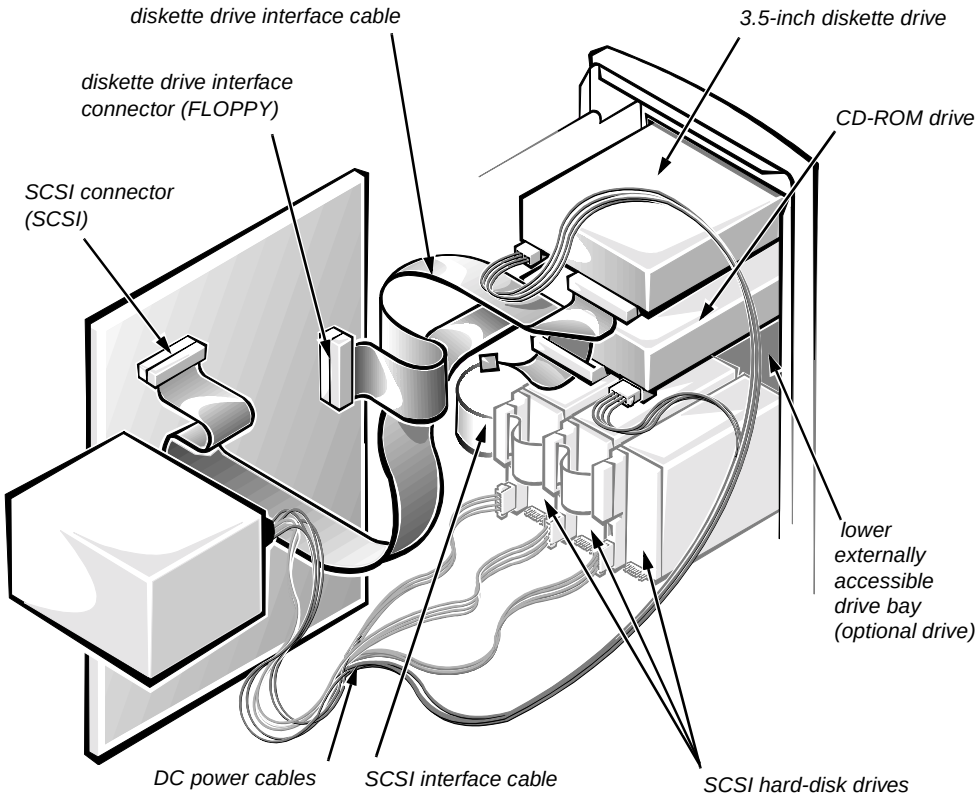


Figure 4-5. Drive Hardware

Externally Accessible Drives

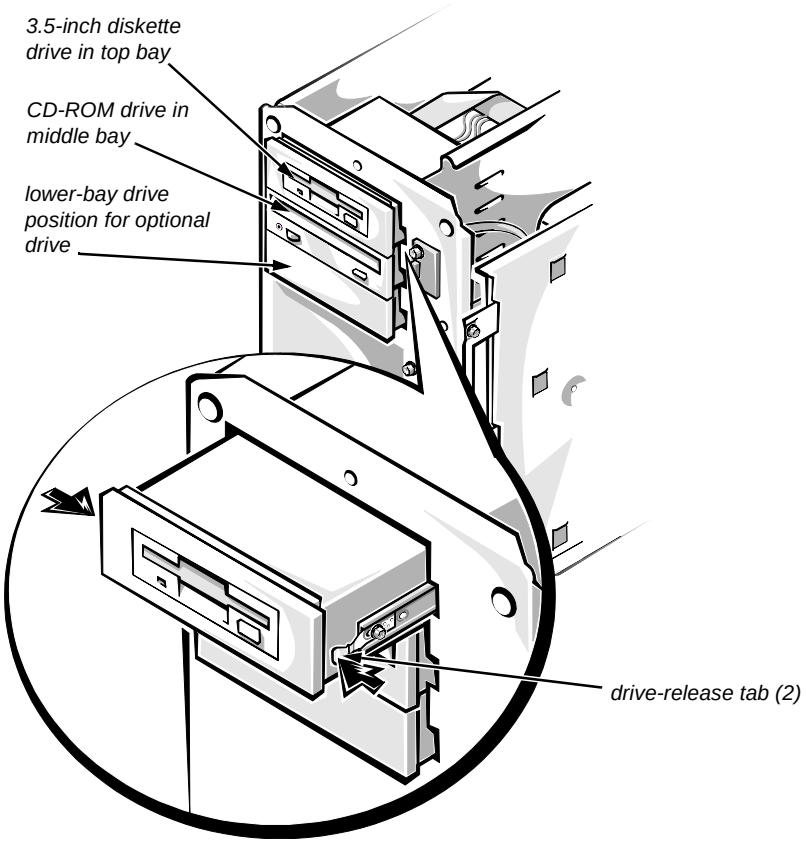

3.5-inch diskette drive in top bay
CD-ROM drive in middle bay
lower-bay drive position for optional drive
drive-release tab (2)

Figure 4-6. Externally Accessible Drives Removal

All of the externally accessible drives have drive-mounting rails. The 3.5-inch drives also have drive-mounting extensions between the drive and the drive-mounting rails. To remove a drive assembly from one of the externally-accessible drive bays, follow these steps:

1. **Disconnect the DC power cable and the interface cable from the back of the drive.**

   Be sure to record the power connector number and interface cable connector identification.

2. **Press inward (toward center of drive) on the two drive-release tabs, and slide the drive out of the bay.**

3. **Remove the drive-mounting rails and drive-mounting extensions (if present) from the drive (see Figure 4-7).**

4. **If the drive is a SCSI drive, record the setting of the SCSI address jumpers and SCSI bus termination jumper.**
5. **If present, remove the 50-pin to 68-pin adapter from the SCSI connector on the back of the drive.**

   Some drives use a 50-pin to 68-pin adapter between the SCSI cable and the drive connector. Check the back of the drive for an adapter, if present, remove it and retain it for use on the new drive.

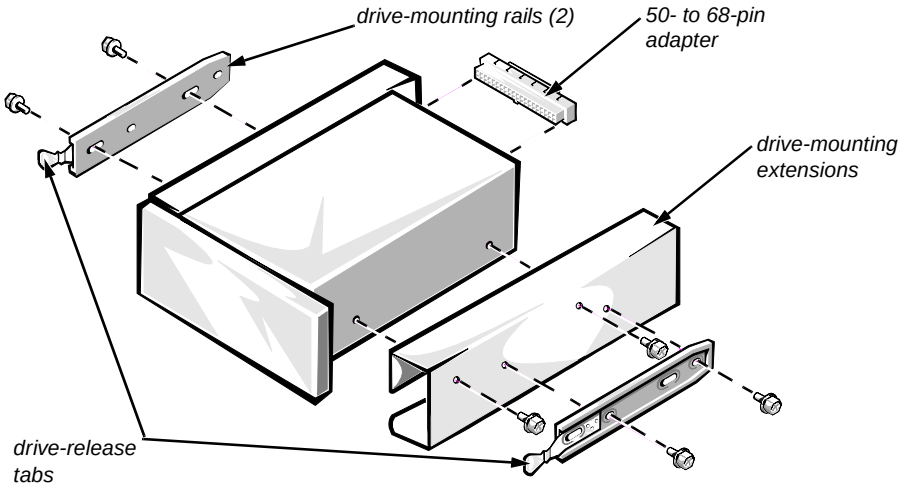


Figure 4-7. Drive-Mounting Rails and Extensions Removal

When you reinstall a SCSI drive, set the SCSI address jumpers and the SCSI bus termination jumpers to the settings you recorded.

Hard-Disk Drives

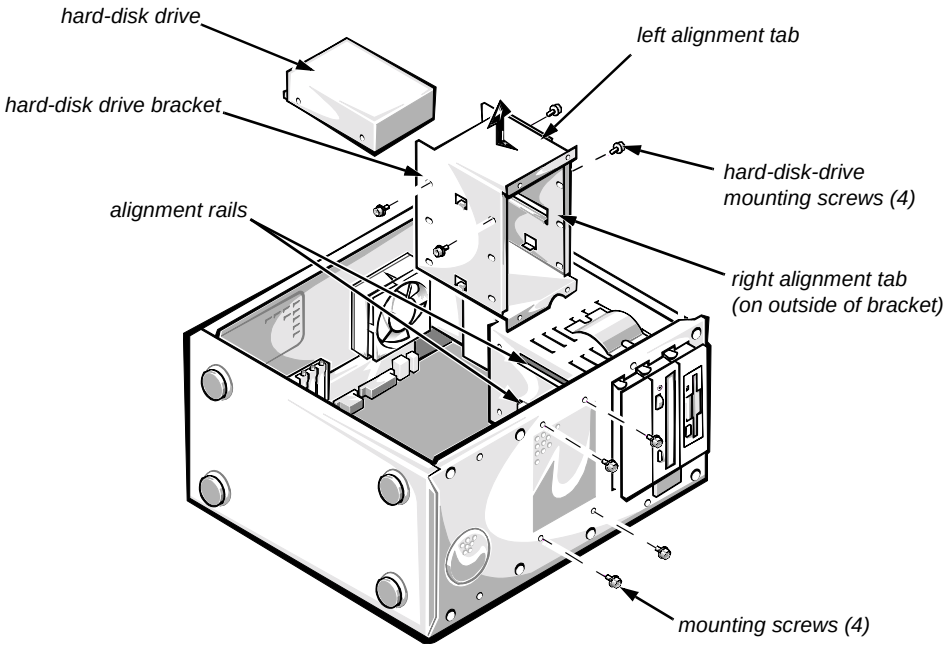


Figure 4-8. Hard-Disk Drive Removal

The hard-disk drives are mounted inside a hard-disk drive bracket. The hard-disk drive bracket must be removed before a hard-disk drive can be removed. To remove a hard-disk drive, follow these steps:

1. **Lay the computer on its right side.**
2. **Disconnect the DC power cable and the SCSI interface cable from the back of each hard-disk drive installed in the hard-disk drive bracket.**
3. **Remove the four mounting screws that attach the hard-disk drive bracket to the front of the computer chassis.**
4. **Slide the hard-disk drive bracket toward the back of the computer until the alignment tabs disengage from the alignment rails; then lift it out of the computer.**
5. **Remove the four hard-disk drive mounting screws from the hard-disk drive; then slide the drive out of the bracket.**
6. **Record the setting of the SCSI address jumpers and SCSI bus termination jumper.**

When you reinstall a hard-disk drive, set the SCSI address jumpers and the SCSI bus termination jumper to the settings you recorded. Be sure you position the hard-disk drive against the side and back tabs inside the hard-disk drive bracket (the mounting holes in the hard-disk drive bracket align with the screw holes in the hard-disk drive).

Expansion Cards

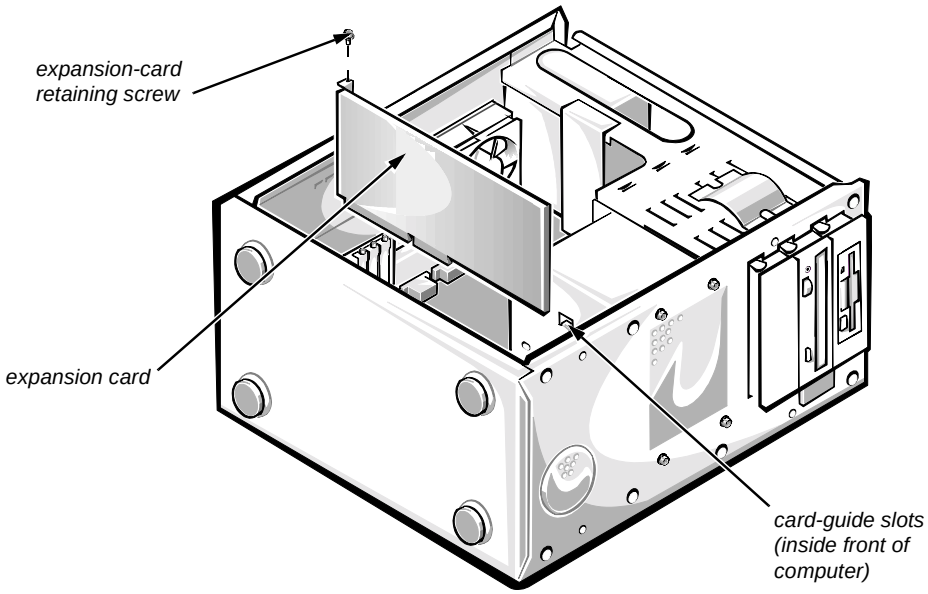


Figure 4-9. Expansion Card Removal

1. **Lay the computer on its right side.**
2. **Disconnect any cables attached to the expansion card you want to remove.**

   Be sure to record the location of each cable before you disconnect it.
3. **Remove the expansion-card retaining screw.**
4. **Grasp the expansion card by its corners, and carefully remove it from the expansion-card connector.**

System Power Supply

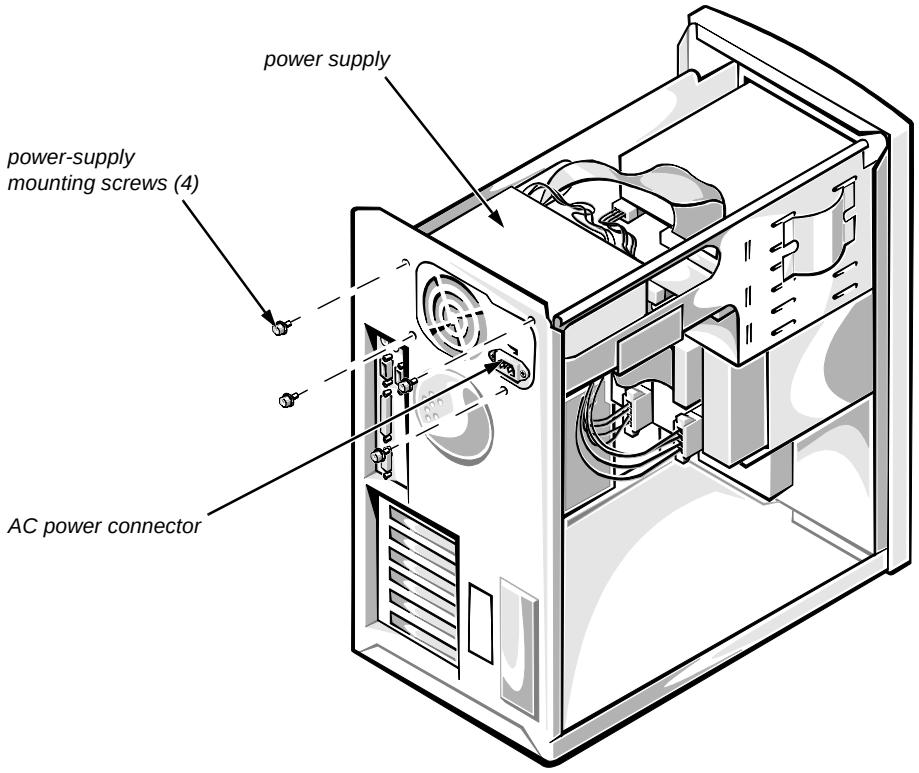


Figure 4-10. Power Supply Removal

To remove the system power supply, follow these steps:

1. **Disconnect the AC power cable from the AC power connector on the back of the power supply.**
2. **Disconnect the DC power cables from the system board (see Figure 4-12), the externally accessible drives, and the hard-disk drives (see Figure 4-5).**

   Be sure to record the connector number and plug location for each power cable.
3. **Remove the four power-supply mounting screws.**
4. **Slide the power supply forward about an inch to clear the retaining tabs, then lift it out of the computer.**

When you reinstall the power supply, be sure the slots on the bottom of the power supply engage the retaining tabs on the computer chassis.

System Cooling Fan

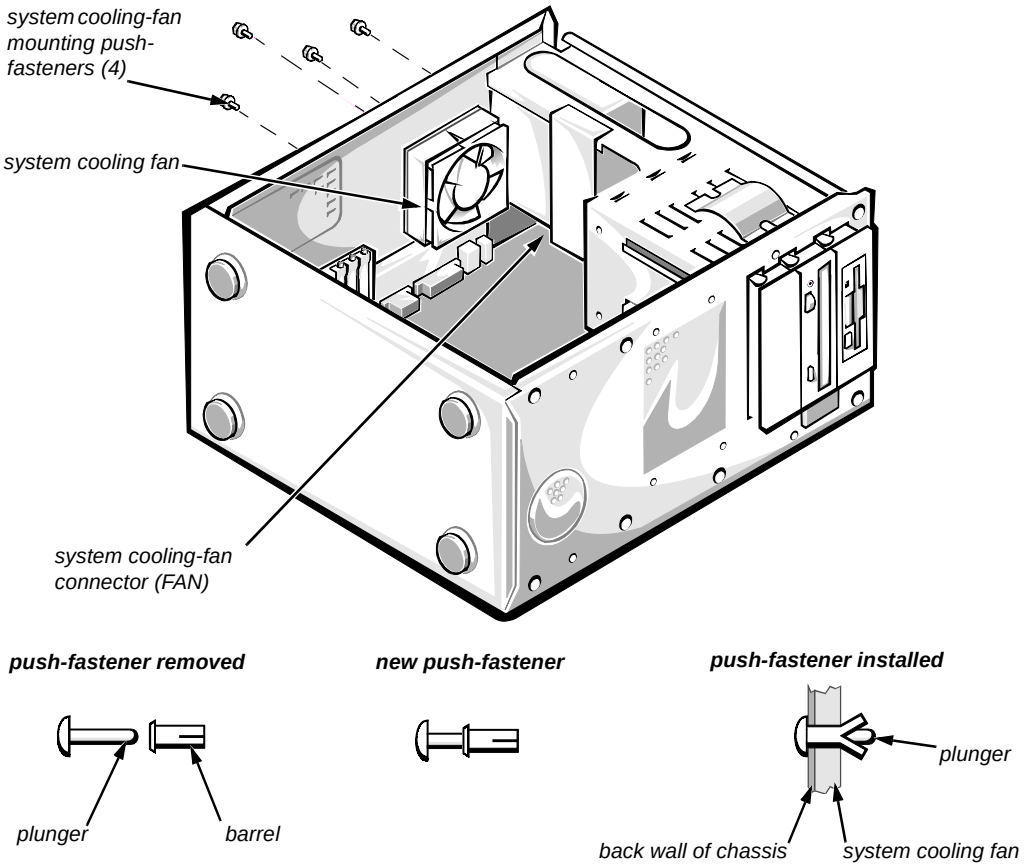


Figure 4-11. System Cooling-Fan Removal

To remove the system cooling fan, follow these steps:

1. **Lay the computer on its right side.**
2. **Disconnect the system cooling-fan cable from the FAN connector on the system board (see Figure 4-12).**
3. **To loosen the system cooling fan from the chassis:**
   a. Push the plunger of each of the four push-fasteners toward the back of the chassis, using a small flat-blade screwdriver (or another small flat object).
   b. From the outside-back of the chassis, pull the plungers completely out of the push-fasteners.
4. **Remove the system cooling fan and the push-fastener barrels from the chassis.**

To replace the system cooling fan, use four new push-fasteners. (New push-fasteners have the plunger inserted part-way into the barrel.) Align the mounting holes in the system cooling fan with the holes in back wall of the chassis. Insert each push-fastener completely; then push in on the plunger to lock the fastener.

System Board Components

The subsections that follow contain procedures for removing system board components.

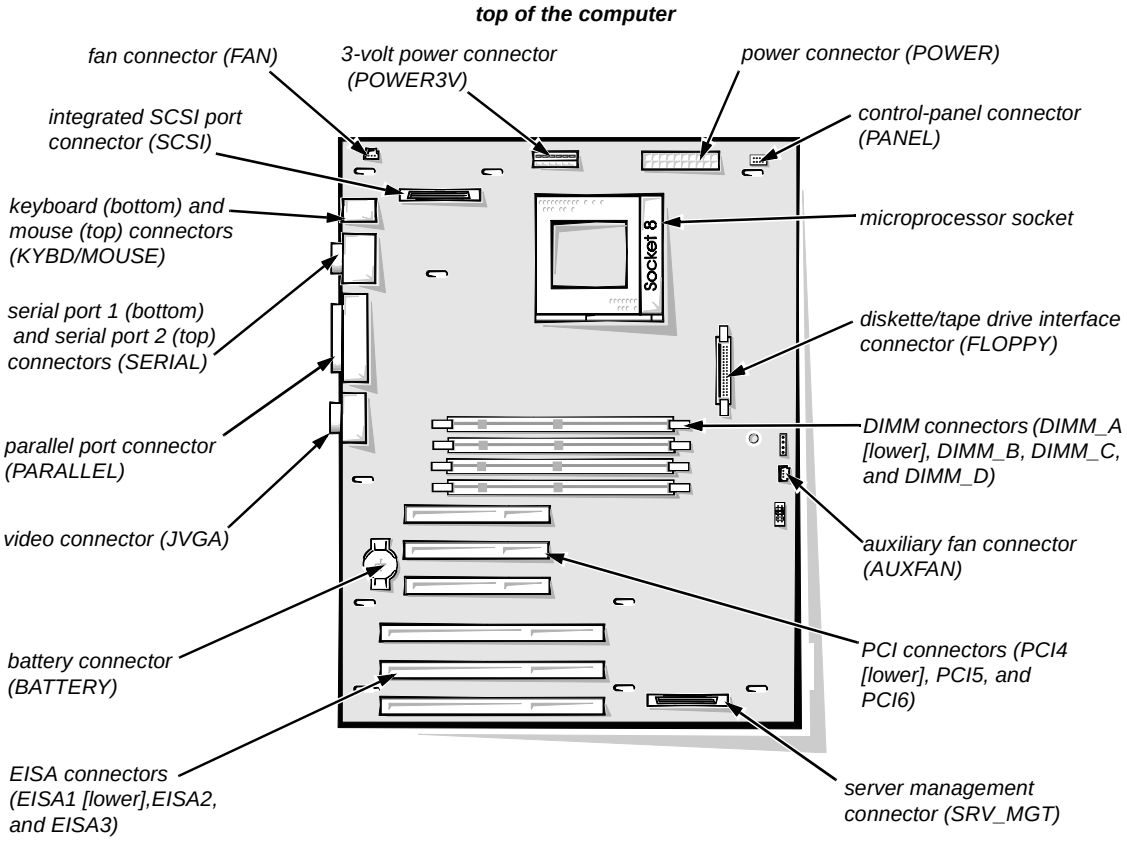

top of the computer
fan connector (FAN)
3-volt power connector (POWER3V)
power connector (POWER)
integrated SCSI port connector (SCSI)
control-panel connector (PANEL)
keyboard (bottom) and mouse (top) connectors (KYBD/MOUSE)
microprocessor socket
Socket 8
serial port 1 (bottom) and serial port 2 (top) connectors (SERIAL)
diskette/tape drive interface connector (FLOPPY)
parallel port connector (PARALLEL)
DIMM connectors (DIMM_A [lower], DIMM_B, DIMM_C, and DIMM_D)
video connector (JVGA)
auxiliary fan connector (AUXFAN)
battery connector (BATTERY)
PCI connectors (PCI4 [lower], PCI5, and PCI6)
EISA connectors (EISA1 [lower],EISA2, and EISA3)
server management connector (SRV_MGT)

Figure 4-12. System Board Components

DIMMs

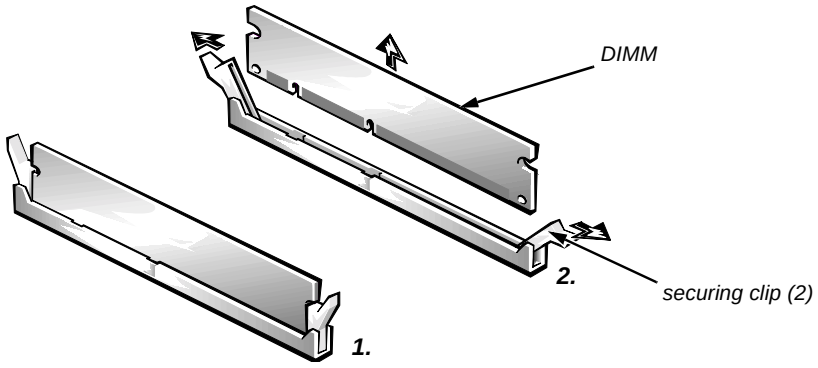


Figure 4-13. DIMM Removal

To remove a DIMM, push outward on the DIMM socket's securing clips until the DIMM is released from its socket. Then lift the DIMM away from the socket.

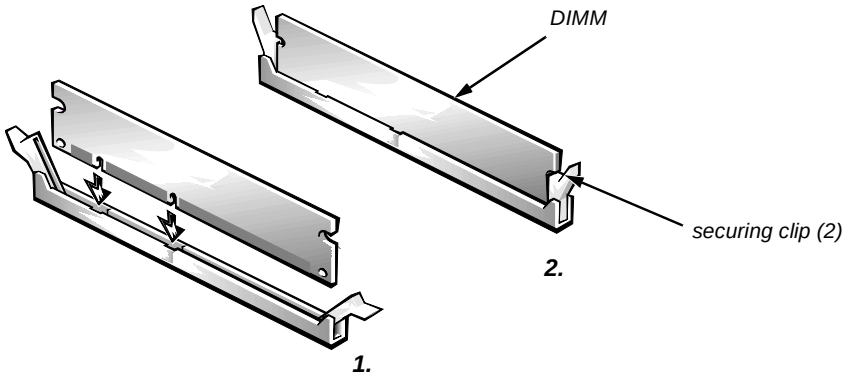


Figure 4-14. DIMM Installation

To replace a DIMM, press outward on the securing clips at each end of the socket until they snap open. Orient the DIMM to the socket, and press down on the outer edges of the DIMM with your thumbs while pulling up on the securing clips until they lock around the ends of the DIMM.

Microprocessor/Heat Sink Assembly

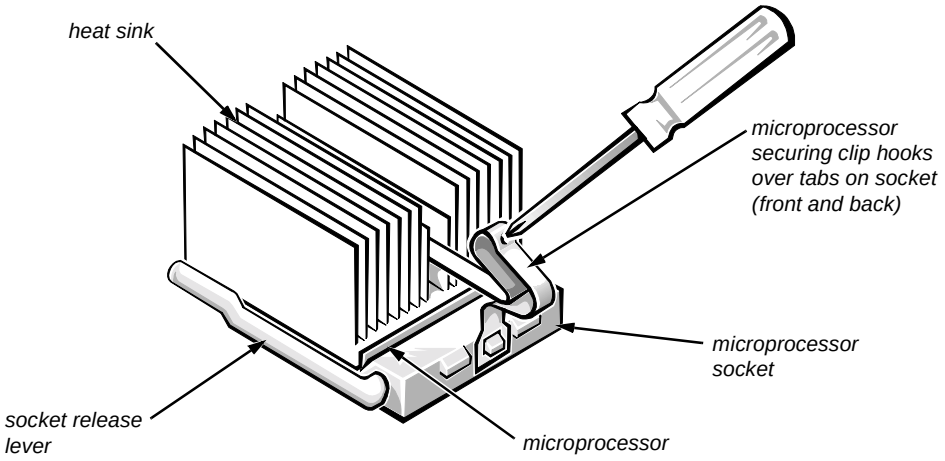


Figure 4-15. Microprocessor Securing Clip Removal

To remove the microprocessor/heat sink assembly, follow these steps:

1. **Remove the system board assembly.**
2. **Lay the system board assembly on a flat surface.**
3. **Remove the microprocessor securing clip from the microprocessor/heat sink assembly.**

   WARNING: The microprocessor can get extremely hot during system operations. Be sure it has had sufficient time to cool before touching it.

   Press down on the folded part of the clip with a small screwdriver to release the clip.
4. **Push outward and then upward on the release lever to rotate the lever to its fully vertical position.**
5. **Lift the microprocessor/heat sink assembly out of its socket (see Figure 4-16).**

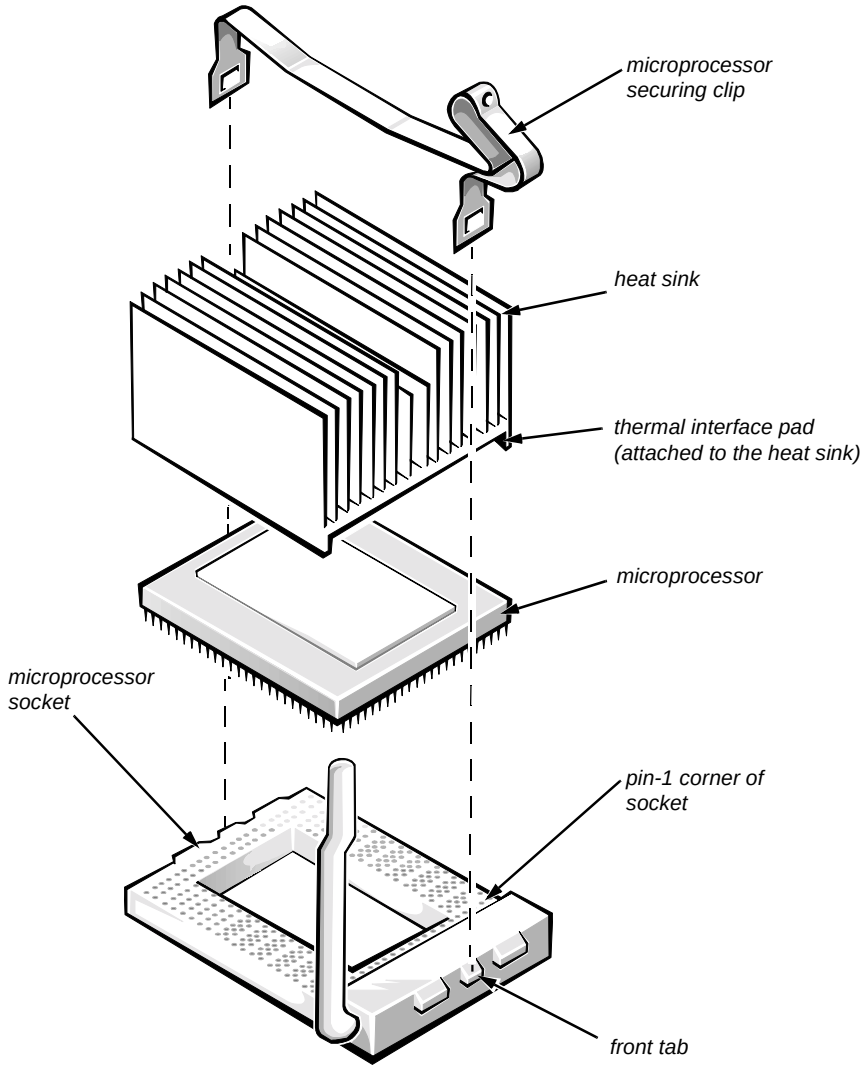


Figure 4-16. Microprocessor/Heat Sink Assembly

The heat sink and microprocessor are separate. Look at the bottom side of the heat sink and peel the thermal-pad protective cover off before attaching the heat sink to the microprocessor.

To install the replacement microprocessor/heat sink assembly, ensure that the microprocessor release lever is in its fully vertical position to allow the microprocessor pins to easily slip into the socket. When the microprocessor/heat sink assembly is in place, rotate the microprocessor release lever to its horizontal position.

NOTE: Pin 1 on the microprocessor is located on the corner with the largest bevel. The pin-1 hole in the microprocessor socket is located on the corner where the holes are in a diagonal pattern.

Hook the microprocessor securing clip over the socket tab nearest the front of the system board, and then snap it over the tab on the back of the socket.

System Battery

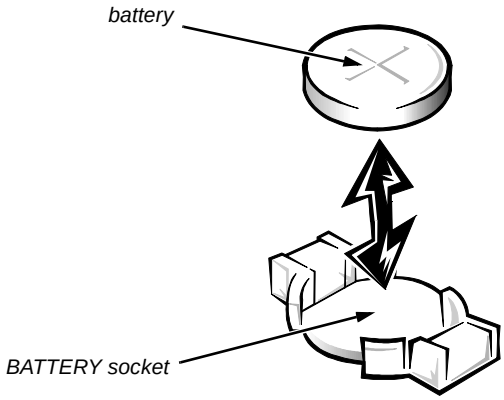


Figure 4-17. System Battery Removal

WARNING: There is a danger of the new battery exploding if it is incorrectly installed. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

To remove the system battery, follow these steps:

1. **If possible, enter the System Setup program, and make a printed copy of the System Setup screens (see Appendix A).**
2. **Lay the computer on its right side.**
3. **Remove any expansion cards installed in the PCI expansion-card slots.**

   Be sure to record the location of any cables attached to the PCI cards being removed.

4. **Remove the battery.**

   Carefully pry the battery out of its socket with your fingers or with a blunt, nonconducting object, such as a plastic screwdriver.

To replace the system battery, orient the new battery with the "+" facing up. Insert the battery into its socket and snap it into place. Compare the system configuration information with the copy of the system configuration settings you made in step 1. Restore any system configuration information lost while replacing the battery.

System Board Assembly

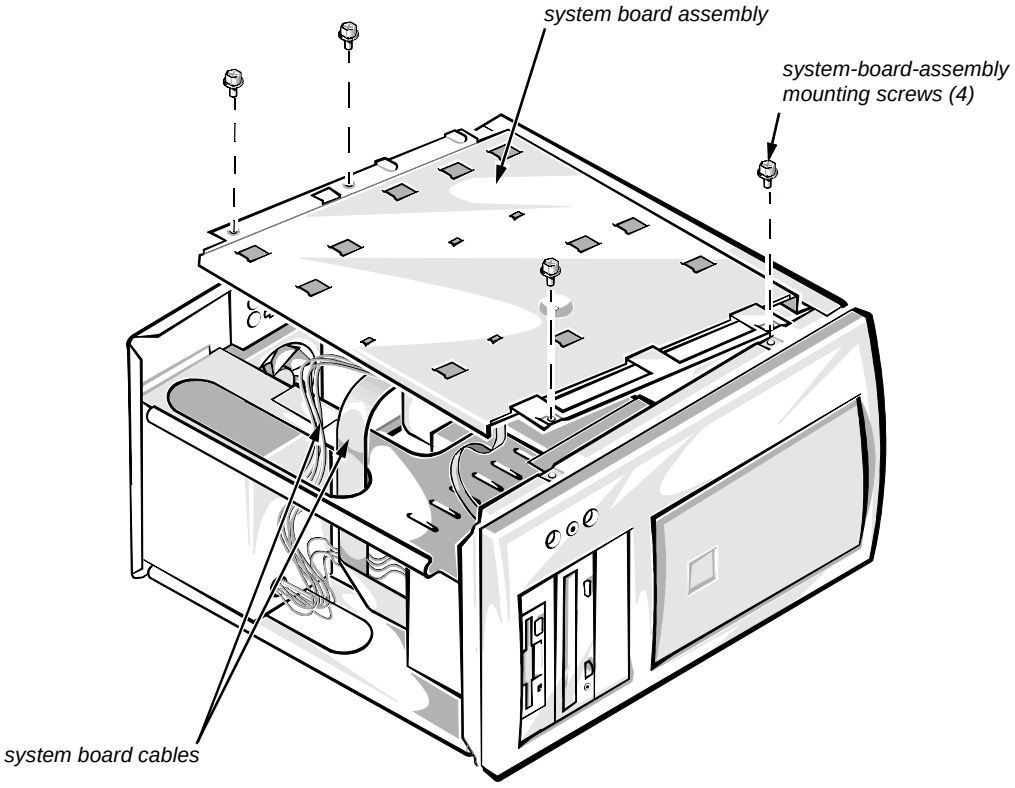


Figure 4-18. System Board Assembly Removal

To remove the system board assembly, follow these steps:

1. **Disconnect all cables from their connectors at the back of the computer.**

   Be sure to record where each cable is attached.

2. **Remove all of the expansion cards.**
3. **Lay the computer on its left side.**
4. **Remove the four system-board-assembly mounting screws.**
5. **Remove the system board assembly from the chassis as follows:**

   a. Slide the system board assembly about a half-inch toward the front of the system (to free the connectors at the back of the system board).

   b. Raise the top of the system board assembly up enough to allow access to the system board cables.

   c. Disconnect the power cables, the control panel cable, the diskette drive interface cable, system cooling-fan cable, and the SCSI interface cable.

6. **Lift the system board assembly away from the computer chassis.**

System Board

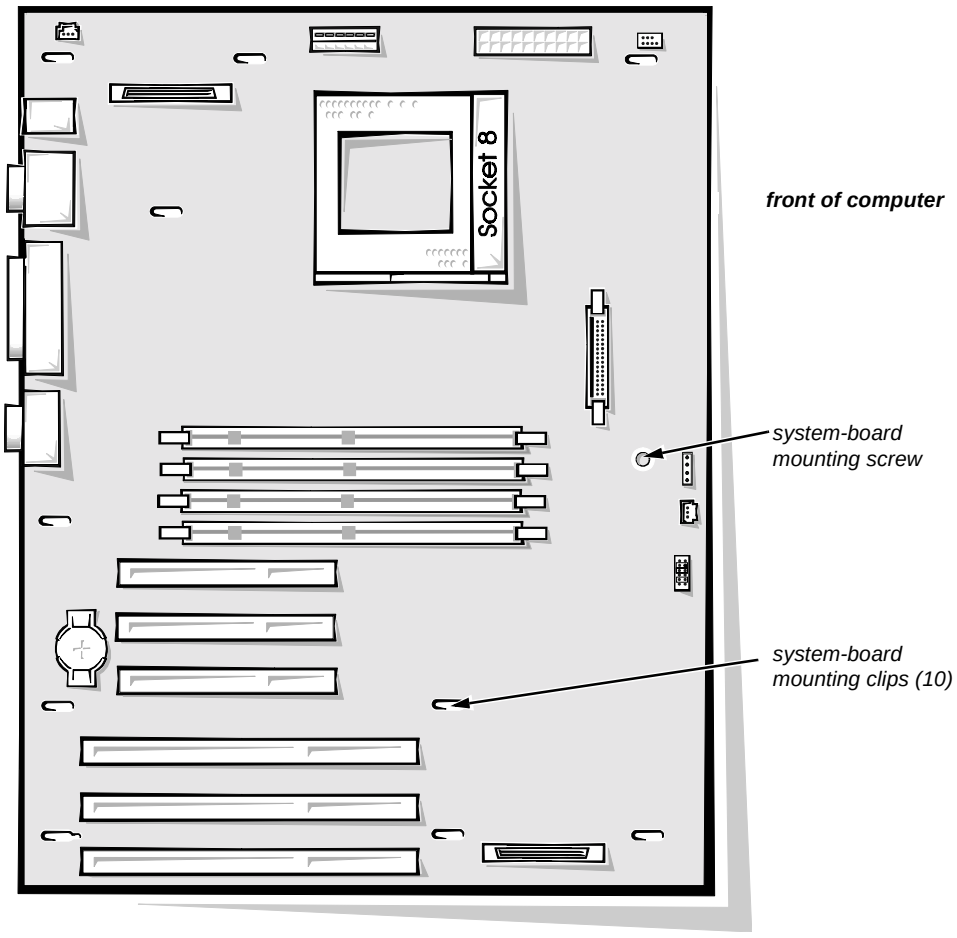


Figure 4-19. System Board Removal

To remove the system board, follow these steps:

1. **Remove the system board assembly.**
2. **Lay the system board assembly on a flat worksurface.**
3. **Remove the system-board mounting screw.**
4. **Slide the system board toward the front of the computer to disengage the system-board mounting clips.**
5. **Lift the system board out of the system-board mounting bracket.**

If you are replacing the system board, remove the DIMMs and the micro-processor from the old system board and install them on the replacement board.

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